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SALISBURY-NORTH 345 kV
TRANSMISSION LINE
EIA STUDY REPORT

Prepared For:

NB Power

Prepared By:

WMS Associates Ltd.

WMS 2945
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EXECUTIVE SUMMARY

1.0 INTRODUCTION

This document is the Environmental Impact Assessment (EIA) Study Report of the proposed Salisbury-North 345 kV transmission line prepared by WMS Associates Ltd. on behalf of NB Power.

The purpose of this EIA study report is to select a preferred and alternative routes for the proposed Salisbury-North 345 kV transmission line by means of a Route Selection Study. Following selection of these routes, the objective is to evaluate the potential biophysical and socioeconomic impacts of the proposed development along the preferred route.

Issues and concerns identified in the EIA Guidelines (Appendix A) prepared by the New Brunswick Department of the Environment, and through public consultation and professional judgement lead to the focusing of the study on and the identification of Valued Environmental Components. Valued Environmental Component is a term used in this study to describe those ecosystem or socioeconomic system components which are valued by society, and which could potentially experience project-related impacts. Valued Socioeconomic Components and Valued Ecosystem Components are referred to collectively as Valued Environmental Components.

The study strategy used in the completion of this EIA Study involves 16 major steps in three phases:

- Phase 1, **Route Selection**, select study corridor, describe environmental setting, public and local government consultation, identify routing constraints, analyze routing alternatives, select a preferred and alternative routes;
- Phase 2, **Issues Scoping**, identify valued environmental components and identify study boundaries; and
- Phase 3, **Impact Assessment**, develop project description, describe environmental setting, analyze impacts, develop mitigation strategy, determine residual impacts, develop compensation strategy, and develop monitoring strategy, and EIA review.

2.0 PROJECT DESCRIPTION

2.1 Project Need and Rationale

Load growth over the last few years is beginning to stress portions of the NB Power high voltage electrical power transmission system, particularly in the northeastern and southeastern parts of the Province. Future load growth is expected to leave these regions in a deficit transmission supply situation and with insufficient voltage support. Further, a 450 MW coal-fired generating station at Belledune is currently under construction to meet domestic load growth requirements. It is scheduled for completion in July of 1993. Exit transmission at 345 kV will be required to connect the unit with the Provincial electrical grid.

Thus, by the load year 1992, operational measures such as imports, load curtailment, large blocks of load shedding or reconfiguration are necessary to maintain supply in the northeast and southeast. To this end, a 345 kV transmission line from Salisbury to Bathurst to Belledune is required to satisfy forecast supply shortages in both the northern and southeastern regions of New Brunswick by 1992.

The following 345 kV transmission changes are thus recommended for the northeast in 1992 as part of this proposed development:

- operate the existing transmission line from Eel River to Bathurst at 345 kV;
- interconnect with the proposed Belledune Generating Station Switching and Terminal Station near Belledune;
- connect the 345 kV transmission to the current load level at the existing Bathurst Terminal via a 345/138 kV transformation; and
- extend the 345 kV transmission line from the Bathurst Terminal Station to the Salisbury Terminal Station 345 kV terminal via the existing Newcastle terminal location for future 345/230 kV transformation.

This proposed expansion to the 345 kV grid:

- will maintain secure supply of electricity to the northeast in the event of a failure on another line;
- provides additional south to north transfer capability and voltage support so that supply can be maintained following loss of either of the existing major transmission lines into the northeast region;
- provides additional north to south transfer capability and voltage support so that supply can be maintained following the loss of the existing major transmission line into the Salisbury/Moncton region;
- provides exit transmission for future generation at Belledune;
- offers the lowest capital cost of the alternatives considered;
- results in the lowest operating cost of the alternatives considered;
- provides additional power transfer capability from sources or purchases in the north to the load centres and interconnection points with other utilities in the south; and
- completes the 345 kV transmission "loop" around the Province, hence offers improved flexibility and security in the energizing, switching and voltage control of the 345 kV grid.

2.2 Proposed and Alternative Routes

The proposed and alternative routes have been selected on the basis of a Route Selection Study (Appendix B). These routes are shown in Figure 1-3 (Chapter One) and on larger scale maps in the back of this report (Maps 1 to 8).

The southern end of the proposed route originates at the Salisbury Terminal Station near Salisbury. It proceeds north, bypassing the Village of Salisbury to the west, and continues north, west of Highway 126, to Barnaby River, where it crosses the Southwest and Northwest Miramichi Rivers to connect with the Newcastle Terminal Station.

The proposed route then proceeds north from Newcastle along the CNR rail line, paralleling an existing transmission line, into the Bathurst Terminal Station on Highway 11. From Bathurst, the proposed route proceeds southwest, skirting the City, then north to a point near Belledune where it connects with the existing Eel River to Bathurst line.

The total length of the proposed route is approximately 241 km.

The route selection process involved constraint mapping and selection of preliminary alternative routes to avoid sensitive areas and resources. The proposed and alternative routes were thus selected to minimize interaction with areas of constraint. A scoring system was used to compare the relative degree of interaction of various preliminary alternative routes. The proposed route showed the lowest score, and thus, the lowest degree of interaction with routing constraints. However, the proposed and alternative routes all represent environmentally acceptable routes which satisfied prescribed routing objectives.

A detailed description and comparative analysis of the proposed and alternative routes are provided.

3.0 VALUED ENVIRONMENTAL COMPONENTS AND STUDY BOUNDARIES

3.1 Valued Environmental Components

The selection of Valued Ecosystem Components was based on four criteria: abundance or status (the abundance and distribution of the species throughout the study area); public concern; professional concern; and economic importance to the people of each area. Valued Ecosystem Components include representative species from the following: large mammals, birds, fish, and endangered species. Water quality and air quality are also identified as Valued Ecosystem Components.

Important socioeconomic issues and concerns were also identified in three ways: through the development of the final Guidelines, public consultation and professional judgement. Valued Socioeconomic Components identified include: land use, communities, land status, public health and safety, communications, and historic and archaeological resources. The specific Valued Ecosystem Components and Valued Socioeconomic Components identified for this study are provided in Table 1.

3.2 Study Boundaries

An important aspect of the environmental impact assessment process is the determination of the study boundaries. Five types of temporal and spatial boundaries were considered in developing the study design and carrying out the EIA. These are project, administrative, ecological, socioeconomic and technical boundaries.

Project boundaries are dictated primarily by the operational requirements, i.e., the expected life span of the line is at least 20 years. Spatially, the right-of-way required is 50 m in width.

Administrative boundaries are the time and space limitations imposed on the assessment for political, social or economic reasons. The proposed transmission lies wholly in New Brunswick, and consequently most of the resources that might be affected by the project are administered through the laws of the Province of New Brunswick.

Ecological boundaries refer to the time and space scale over which natural systems function. The time scales that need to be considered in assessing impact vary widely among species. In addition, ecological systems such as migratory bird and anadromous fish populations, and moose and white-tailed deer populations which exhibit seasonal shifts in habitat use, results in impacts which extend beyond the boundaries of the proposed right-of-way. The selection criteria and population, spatial, and temporal boundaries were established for all Valued Ecosystem Components.

Socioeconomic boundaries refer to the temporal and spatial scales for economic systems and socio-cultural aspects of the environment. Socioeconomic boundaries were established on the following spatial characteristics of the socioeconomic environment: project-related social and economic impacts that are not confined to the boundaries of the project; the interdependence of the market system on local, regional, Provincial, national and international forces; and resource harvesting activities, i.e., salmon rivers when the fishing season is open.

TABLE 1: VALUED ENVIRONMENTAL COMPONENTS

VALUED ECOSYSTEM COMPONENTS

White-tailed Deer
Moose
Marten
Waterfowl
Upland Game Birds
Atlantic Salmon
Brook Trout
Eastern Cougar
Lynx
Bald Eagle
Osprey
Water Quality
Air Quality

VALUED SOCIOECONOMIC COMPONENTS

Sport Fishing
Hunting
Snowmobiling
Cross Country Skiing
Canoeing
Camping
Forestry
Agriculture
Mining and Mineral Resources
Trapping
Airports
Outfitting
Maple Sugar
Fox Farms
Land Value
Land Rights
Electric and Magnetic Fields
Aviation
Herbicides
Induced Current
Communications
Historic and Archaeological Resources

Technical boundaries are defined by the technical limitations on the ability to predict and monitor impacts. Several important technical boundaries exist with respect to the proposed transmission line. For some Valued Environmental Components, the technical boundaries relate to a lack of existing information and an inability to meaningfully evaluate the potential impacts of the project at various points in the future. Consequently, it is often necessary to rely extensively on professional judgement to interpret the available data and make predictions.

Predictions are also based on environmental conditions as they currently exist which may not be realistic over the life of the project.

4.0 BIOPHYSICAL SETTING

The character and status of Valued Ecosystem Components along the proposed route are described to provide a basis for predicting environmental change, and as a baseline for subsequent Environmental Effects Monitoring studies. For those Valued Ecosystem Components that are comprised of wildlife species or species groups, information is provided on their habitat relationships, on their limiting factors, and on their current habitat suitability.

The natural environment along the proposed route is a reflection of geological and climatological conditions that exist in eastern and northern New Brunswick. The region is generally flat, lying below 150 m elevation. Rivers, flowing toward the Saint John River Valley, the Northumberland Strait and the Bay of Chaleurs, tend to break up the terrain into deep valleys, particularly in the north. Inland, the climate is continental, with warm, dry summers and snow cover lasting up to five months. The climate is maritime along the north coast, where the weather is moderated by winds from the Bay of Chaleurs. Forest vegetation is dominated by red and black spruce, white pine, red maple, and white birch. Jack pine is often established on well-drained sites, following forest fires. Wetlands tend to average large, 65 to 90 ha, in the Salisbury to Bathurst area, but small, less than 20 ha, between Bathurst and Belledune; the wetlands are usually deep marshes, shrub swamps or extensive bogs.

White-tailed deer and moose are common throughout this portion of the Province, and some deer winter in traditional areas near or on the proposed route. Pine marten inhabit mature conifer and mixedwood stands in localized areas of the proposed route generally north of Newcastle. New Brunswick is part of the Atlantic Flyway for waterfowl, and is frequented by the black duck, and to a lesser degree green-winged teal, ring-necked duck, and common merganser. Due to relatively lower wetland productivity, eastern New Brunswick supports low densities of breeding waterfowl. Osprey is relatively common, and there is one bald eagle nest in the vicinity of the proposed route. Ruffed grouse and spruce grouse are found in upland sites. The forest avifauna comprises a wide range of species common in eastern North America.

Populations of Atlantic salmon and brook trout are found in most rivers of the region.

Forest cutting practices have had the greatest impact on the environment of the region. Virgin forest are uncommon, with most stands having been recently cut or scheduled for harvest within the next 25 years. Industrial activity is minimal, except in the vicinity of Newcastle, Bathurst and Belledune, and air and water quality remain relatively pristine away from those centres, excluding the influences of the long-range transport of airborne pollutants, and locally, untreated sewage.

Hunting, trapping and fishing are under the jurisdiction of various federal and provincial agencies. Regulations outline harvest allocations but illegal harvesting of both fish and wildlife by local residents appears to be a serious limiting factor for the population of some species.

5.0 SOCIOECONOMIC SETTING

The socioeconomic setting is a description of how people live, how they earn their livelihoods and the physical, cultural and social context in which these activities occur.

The spatial boundaries of the region in which the proposed transmission line would be built are complex. Public activities within the study corridor are largely conducted by the residents of Albert, Westmorland, Kent, Northumberland, Gloucester and Restigouche Counties. In the regional overview, three socioeconomic units are considered: the Salisbury to Newcastle region, the Newcastle to Bathurst region, and the Bathurst to Belledune region. The regional socioeconomic setting, included as the second section of Appendix B, provides a regional overview of the study corridor. Settlement patterns, local government structure, population, and demographic information are presented to provide a context for the proposed Salisbury-North transmission line. More detailed information is presented in the socioeconomic setting for the proposed route on recreational land use, commercial land use, private and crown land, communications, and historic and archaeological resources.

An overview of each of the Valued Socioeconomic Components is provided. Most of the proposed route passes through woodland, both privately owned and crown land. The cut-over areas and burned areas, together with resource extraction by the forestry industry, are the major areas of stress on the natural environment.

Recreational land use is generally outdoors oriented; consumptive activities include sport fishing and hunting with snowmobiling, cross-country skiing, canoeing and camping being the primary non-consumptive activities.

Commercial land use is primarily forestry related, with secondary uses including agriculture, mining and mineral resources, and outfitting. Generally, the proposed route avoids silvicultural operations, and crosses them only when necessary; extensive areas of silvicultural operations are avoided. Few agricultural areas are located along the proposed route, and these are mostly in the extensive areas of private land in the Salisbury area, along Highway 126, the Newcastle area, and the areas south and west of Bathurst. Fields are generally small in extent, and are bordered by forest. Very little trapping occurs within the right-of-way of the proposed route. The proposed route passes through one area with extensive mining claims between Bathurst and Belledune, but avoids all active claims. The proposed route avoids all areas with commercial peat extraction leases, but passes through three bogs with peat extraction development potential. Maple sugar operations are avoided by the proposed route. The operations of two outfitters extend to within the boundaries of the proposed route.

6.0 BIOPHYSICAL IMPACT ASSESSMENT

The biophysical impact assessment focuses on the evaluation of potential interactions between the various project activities, and Valued Ecosystem Components. To ensure that potential impacts are evaluated on a comparable basis for the proposed transmission line, the evaluation process is standardized. In addition to describing the nature of impact, the evaluation employs a numerical rating system to indicate the magnitude, duration, geographical extent and probable frequency of occurrence of expected interactions.

Potential impacts on Valued Ecosystem Components are assessed on the basis of a review of relevant literature, consultation with experts, and professional judgement. Ratings are also provided to indicate the level of confidence and range of uncertainty associated with each impact prediction. Impact predictions also reflect "worst-case" scenarios.

The impact assessment includes the potential interactions with the Valued Ecosystem Components; issues and concerns; existing knowledge; and the impact prediction for each of the three project activities, for all 13 Valued Ecosystem Components. The three project activities considered are: construction, operation, and accidental events. The impact predictions can be major, moderate, minor or negligible. Clear population-based definitions of these ratings are provided for rigorous impact prediction. This impact rating is determined without consideration of any mitigation strategy which may lessen or eliminate the impact.

A summary of impact ratings for each section of the line is provided for each project activity in Table 2. The majority of impacts are negligible or less with the exception of two minor impacts each for construction and operation. There are fifteen minor impacts associated with accidental events.

Biophysical cumulative impacts are also assessed in the EIA Study Report. This analysis presents an assessment of the overall impact of both project and non-project activities on Valued Ecosystem Components. For example, the cumulative impact of the project on wildlife is considered in the context of natural mortality, legal and illegal harvesting, collision with vehicles, and habitat degradation due to forest resource harvesting.

7.0 SOCIOECONOMIC IMPACT ASSESSMENT

The socioeconomic impact assessment focuses on the evaluation of potential interactions between the various project activities, and Valued Socioeconomic Components. To ensure that potential impacts are evaluated on a comparable basis for the proposed transmission line, the evaluation process is standardized following a similar process to that described in Section 6.0 for Valued Ecosystem Components.

The impact assessment includes the potential interactions with each of the three project activities and for all 23 Valued Socioeconomic Components. The project activities considered are: construction, operation and accidental events.

A summary of the number of negligible, minor, moderate, and major impact predictions is provided by project activity in Table 3. An indication of those impact predictions which are positive is also indicated in Table 3. A majority of the impact predictions are negligible or less. There are only a very few minor, and one moderate impact predicted (on forestry).

TABLE 2: SUMMARY OF THE NUMBER OF IMPACT PREDICTIONS FOR VALUED ECOSYSTEM COMPONENTS. BY PROJECT ACTIVITY

	SALISBURY-NEWCASTLE	NEWCASTLE-BATHURST	BATHURST-BELLEDUNE
Construction			
Negligible Impact	10	11	12
Minor Impact	1	1	
Not Applicable	1		
Operation			
Negligible Impact	7	8	9
Minor Impact	2*	2*	1*
No Impact	3	3	3
Not Applicable	1		
Accidental Events			
Negative Impact	6	6	6
Minor Impact	6*	6*	6*

* includes one positive minor impact

TABLE 3: SUMMARY OF THE NUMBER OF IMPACT PREDICTIONS FOR VALUED SOCIOECONOMIC COMPONENTS, BY PROJECT ACTIVITY

	SALISBURY-NEWCASTLE	NEWCASTLE-BATHURST	BATHURST-BELLEDUNE
Construction			
Negligible Impact	9	7	7
Minor Impact	2*	2*	2*
No Impact		1	
Not Applicable		1	2
Operation			
Negligible Impact	17	12	13
Minor Impact	1**	1*	1*
Moderate Impact	1	1	1
No Impact		3	1
Not Applicable		2	3
Accidental Events			
Negligible Impact	17	14	14
Moderate Impact	1	1	1
No Impact	1	2	1
Not Applicable		2	3

* includes one positive minor impact
** includes three positive minor impacts

Socioeconomic cumulative impacts are also assessed. This analysis presents an assessment of the overall impact of both project and non-project activities on Valued Socioeconomic Components.

8.0 MITIGATION, RESIDUAL IMPACTS, AND MONITORING

With the application of a comprehensive mitigation program, many of the predicted impacts can be reduced. Notwithstanding mitigation, the residual impact analysis determined that there are numerous negligible or no residual impacts, with only two impacts rated as moderate (forestry in relation to normal operations and accidental events), and a few which are minor. These are summarized in Figures 1 and 2.

To further characterize and potentially reduce predicted impacts, NB Power has proposed a Monitoring Program which is comprised of both Environmental Compliance Monitoring and Environmental Effects Monitoring Studies. The Environmental Compliance Monitoring program outlines how NB Power intends to ensure it complies with regulatory requirements through Environmental Protection Planning and Contingency Planning. The Environmental Effects Monitoring program is comprised of two focused studies which address Electric and Magnetic Fields (EMF) and Osprey.

NB Power is committed to develop a compensation package to address compensation issues. Over the years, NB Power has developed several compensation policies to address specific issues. These will be implemented as appropriate.

Overall, the mitigation, monitoring and compensation proposed will serve to refine and further reduce the net impact rating of the proposed construction and operation of the proposed transmission line.

9.0 CONCLUSIONS

In view of the findings of this EIA Study Report, it is concluded that it would be acceptable to proceed with the proposed transmission line development. However, this conclusion is predicated on the fact that to effectively manage potential impacts, NB Power must rigorously implement the proposed mitigation, monitoring and compensation program to minimize negative impacts and maximize positive impacts.

CHAPTER ONE
INTRODUCTION

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1.0 INTRODUCTION

This document is an Environmental Impact Assessment (EIA) study report of the proposed Salisbury-North (Salisbury to Newcastle to Bathurst to Belledune) 345 kV transmission line in New Brunswick. This report has been prepared by WMS Associates Ltd. on behalf of the New Brunswick Electric Power Commission (NB Power) pursuant to Section 11(1) of the **Environmental Impact Assessment Regulation - Clean Environment Act** (New Brunswick Regulation 87-83).

The purpose of this EIA study report is to select proposed and alternative routes for the proposed Salisbury-North 345 kV transmission line by means of a Route Selection Study. Following selection of these routes, the objective is to evaluate the potential biophysical and socioeconomic impacts of the proposed development along the proposed route. The following paragraphs outline the background for this proposed development.

1.1 Project Need and Rationale

Load growth over the last few years is beginning to stress portions of the NB Power high voltage electrical power transmission system, particularly in the northeastern and southeastern parts of the Province (NB Power 1990). Future load growth is expected to leave these regions in a deficit transmission supply situation and with insufficient voltage support. To offset these deficits operational measures such as imports, reconfiguration or load curtailment are necessary to maintain supply.

A 450 MW coal-fired generating station at Belledune is currently under construction to meet domestic load growth requirements (NB Power 1988). It is scheduled for completion in July of 1993. Exit transmission at 345 kV will be required to connect the unit with the Provincial electrical grid.

The existing transmission system into the northeastern region consists of two major infeeds:

- the 345 kV transmission lines #3011 (Keswick to St. André) and #3010 (St. André to Eel River); and
- the 230 kV transmission line #2131 (Keswick to Newcastle to Bathurst).

The transfer capability of the existing transmission system into the northeast has already exceeded its maximum under a single contingency fault condition; the loss of line #3011 at the present time would leave the northeast a deficit supply situation with inadequate voltage support.

By the year 1992, the transfer capability of the existing transmission system into the Moncton/Salisbury region will have reached its maximum under a single contingency fault condition (NB Power 1990); loss or interruption of the 345 kV transmission lines #3004 (Coleson Cove to Norton) or #3013 (Norton to Salisbury) would leave the region in a deficit transmission supply situation with inadequate voltage support.

Thus, by the load year 1992, operational measures such as imports, load curtailment, large blocks of load shedding or reconfiguration are necessary to maintain supply in the northeast and southeast.

The following 345 kV transmission changes are thus recommended for the northeast in 1992:

- operate the existing transmission line #3008 from Eel River to Bathurst at 345 kV;
- interconnect with the proposed Belledune Generating Station Switching and Terminal Station north of line #3008 right-of-way near Belledune;
- connect the 345 kV transmission to the current load level at the existing Bathurst Terminal via a 345/138 kV transformation; and
- extend the 345 kV transmission line from the Bathurst Terminal Station to the Salisbury Terminal Station 345 kV terminal via the existing Newcastle terminal location for future 345/230 kV transformation.

This proposed expansion to the 345 kV grid:

- will maintain secure supply of electricity to the northeast in the event of a failure on another line;

- provides additional south to north transfer capability and voltage support so that supply can be maintained following loss of either of the existing major transmission lines (#3011/3010 or #2131) into the northeast region;
- provides additional north to south transfer capability and voltage support so that supply can be maintained following the loss of the existing major transmission line (#3004/#3013) into the Salisbury/Moncton region;
- provides exit transmission for future generation at Belledune;
- offers the lowest capital cost of the alternatives considered;
- results in the lowest operating cost of the alternatives considered;
- provides additional power transfer capability from sources or purchases in the north to the load centres and interconnection points with other utilities in the south; and
- completes the 345 kV transmission "loop" around the Province, hence offers improved flexibility and security in the energizing, switching and voltage control of the 345 kV grid.

A 345 kV transmission line from Salisbury to Bathurst to Belledune is required to satisfy forecast supply shortages in both the northern and southeastern regions of New Brunswick by 1992.

1.1.1 Southeast

Currently, seven transmission lines, with a total transmission capacity of 1381 MW, supply power to the Moncton Area. In the event of the failure of the largest existing line, a 345 kV transmission line with a capacity of 663 MW, total transmission capacity to the region would be reduced to 718 MW.

NB Power, in its 1988 Load Forecast Report (NB Power 1988), expects the load for the Moncton area to reach 498 MW by 1992. In addition, 70 MW are transmitted to Prince Edward Island through Moncton, resulting in an area load of 568 MW for the region. An additional 160 MW are diverted west of Moncton, resulting in a net load of 728 MW for the Moncton area by 1992.

Present transmission capacity of 718 MW, in the event of a fault on the 345 kV line, will sustain the Moncton Area Load until 1992. Load growth beyond 1992 will exceed this capacity.

1.1.2 Northeast

Presently, northern New Brunswick is serviced by five transmission lines with a total carrying capacity of 1302 MW. The failure of the largest existing line, a 345 kV line with capacity of 663 MW, would decrease capacity to 639 MW. The 1988 Load Forecast (NB Power 1988) predicts that area load for northeastern New Brunswick will be 1148 MW by 1992. Of this total, 350 MW can be generated within the region reducing net area load to 798 MW for 1992. Under failure of the existing 345 kV line, this level of demand will result in a net deficit of 159 MW in the region by 1992.

The proposed 345 kV Salisbury-North transmission line additions would enable NB Power to supply forecast area load under single contingency fault conditions to the northeast.

1.1.3 Bathurst To Belledune

Line #3008 is an existing 345 kV transmission line currently energized at 230 kV between Dalhousie and Bathurst. In 1992 NB Power will upgrade this line to its full 345 kV transmission capacity as part of this project. By approximately 1997, forecast load increases in the northeast will require additional generation in the region, possibly at Belledune, but potentially anywhere in New Brunswick.

A second 345 kV line from Bathurst to Belledune is proposed by NB Power as part of this project in order to meet area transmission capacity under failure conditions after approximately 1997.

1.2 Project Alternatives

Increased load growth in recent years is now beginning to strain some parts of the transmission system, especially in the northeastern and southeastern parts of the Province. Without any transmission line additions, there is a significant probability of transmission shortages, which may lead to temporary load curtailment in Saint John and Moncton during winter peak or heavy load conditions.

Secondly, reduced reliability of power supply in the Bathurst area is currently possible in the event of the loss of another line. As outlined in the previous section, the region is currently in a deficit transmission capacity condition, and by 1992 this will be in the order of 159 MW if additional transmission facilities are not made available.

Simply stated, there are three basic alternatives:

- do nothing;
- expend existing facilities; and
- construct new lines.

These alternatives are considered in the following sections.

The possibility of using existing corridors has been considered and incorporated in the Route Selection Study. The use of variable width corridors has been considered but determined to be impractical and unnecessary to accommodate the requirements of Valued Environmental Components.

1.2.1 Evaluation of Transmission Alternatives and Voltage Level

NB Power has conducted studies to evaluate the 345 kV and the 230 kV voltage levels to serve the northeast. A study "NB Power Major Transmission Development 1988-2003" (G.B. Furst Consultants 1988) concluded that supply to the northeast at 230 kV through the conversion of the 138 kV lines #1101 (Grand Lake to Moncton) and #1105 (Grand Lake to Newcastle) "is neither an economically nor technically desirable alternative" (NB Power 1990). Use of the 230 kV level for exit transmission was ruled out because of the major reinforcements required for more than one Belledune unit and the higher system losses than would be experienced at the 345 kV transmission level. Studies of alternative transmission reinforcements to the southeast and northeast support the 345 kV options (NB Power 1990).

The existing 230 kV transmission system will adequately supply the transformation capacity to the load centres at Bathurst and Newcastle until 1992. After that point, the best role for the 230 kV system is that of an underlay voltage level for the 345 kV grid. In this role, it will preclude underlay transfer and voltage support problems like those in the southeast on the 138 kV system between Saint John and Moncton.

1.2.2 Evaluation of Northeast Termination Alternatives (1992)

The four options considered are outlined below:

- Option 1 - 345/138 kV transformation at Belledune;
- Option 2 - 345/230 kV transformation at Belledune;
- Option 3 - 345/138 kV transformation at Bathurst; and
- Option 4 - 345/230 kV transformation at Newcastle.

Options 1 and 2 differ only in the low side transformation level. In Option 1, an additional 138 kV transmission line is required into the Bathurst area to supply the load requirements. Option 2 requires the energizing and switching of 145 miles of 345 kV transmission from Salisbury to Belledune. Experience and preliminary studies indicate this is unacceptable. Option 4 transformation is remote from the Bathurst load centre, therefore, the increased losses and high initial capital cost rule out this alternative. Option 3 is the best option to meet the technical requirements and has the lowest system losses and the least initial capital investment.

Option 3 decreases system losses by 9.8 MW (estimated saving of about $1,000,000 annually) and capital investment by about $2,000,000 compared to Option 2. Option 3 decreases system losses by 9.1 MW (estimated saving of $900,000 annually) and capital investment by about $6,000,000 compared to Option 1.

1.2.3 Alternative Routes

The proposed and alternative routes have been selected on the basis of a Route Selection Study which is presented in Appendix B. These routes are identified in Maps 1 to 8 at the back of this report.

1.3 Following the EIA Process

This section outlines the EIA process in New Brunswick in general terms and identifies the milestones which have been achieved to date in satisfying the requirements of the EIA process for the proposed route.

The proposal to construct a 345 kV transmission line was registered with the Minister of Environment on January 26, 1989, as required under **Environmental Impact Assessment Regulation - Clean Environment Act** (New Brunswick Regulation 87-83). Upon screening the registration, the Minister determined that an EIA was required. NB Power was advised of this decision on June 30, 1989.

The Minister of Environment established a Review Committee which, in consultation with NB Power, developed draft Guidelines for the EIA Study. These were issued for public review on November 28, 1989. Following a 30 day public review period, the Minister of Environment revised and issued the final Guidelines on February 9, 1990 (Appendix A).

Prior to proceeding, NB Power developed Terms of Reference (WMS 1990b) for the EIA Study. These Terms of Reference were submitted to the Minister of Environment on April 23, 1990. NB Power commenced the Route Selection Study in November of 1989 and the EIA Study in December, 1989. The findings are being reported in this draft EIA study report.

The Review Committee will evaluate this draft EIA study report to determine whether or not the document has satisfied the Guidelines. If this draft EIA study report is found to be satisfactory by the Review Committee, the Minister will accept the final EIA study report pursuant to Section 11(4) of the **Environmental Impact Assessment Regulation - Clean Environment Act** (New Brunswick Regulation 87-83). NB Power will then provide to the Minister 30 copies of the final EIA study report in both official languages.

A summary of the final EIA study report will be prepared on behalf of the Minister of Environment. The Review Committee will also prepare a General Review Statement summarizing its comments on the document.

Within 30 days of receiving the final EIA study report, the Minister will release the combined documentation for public review and comment. At the same time, a schedule for public meetings to discuss the EIA information will be announced by the Minister. A minimum of 30 days following the release of the EIA information will be provided for public review, before any meeting is scheduled. The public will also be invited to submit written briefs.

Following public meetings, an additional period of 15 days is set aside for members of the public to submit further written comments regarding the proposal. At the end of this period, a summary of public participation will be prepared, and copies will be sent to every person who participated actively in the public discussion. At the same time, the full package of EIA study information, including the public participation summary, is forwarded to the Minister for final consideration.

At any time after this date, the Minister will submit a report and a recommendation concerning the proposal to the Lieutenant-Governor in Council. It is the responsibility of the Lieutenant-Governor in Council to consider the report as well as the recommendation of the Minister, and issue or deny any approval for the proposed project. If approval is given, terms and conditions may be stipulated, to which NB Power must adhere in implementing the project.

EIA approval does not exempt NB Power from other applicable statutory requirements, such as the provisions of the **Clean Environment Act** or any other relevant legislation which applies to the project.

1.4 Scope of the Study

This EIA study has been conducted in accordance with the **Environmental Impact Assessment Regulation - Clean Environment Act** (New Brunswick Regulation 87-83). This EIA study report has been prepared to address the specific requirements of the final Guidelines (Appendix A) and the Terms of Reference (WMS 1990b) which outline the approach to the EIA Study. The final Guidelines identified a number of issues to be addressed and outlined a number of methodological requirements for the preparation of the EIA study report.

The identification of issues and concerns has lead to the identification of Valued Environmental Components (Chapter Three). Valued Environmental Component is a term used in this study to described those ecosystem or socioeconomic components which are valued by society, and which could potentially experience project-related impacts. Potential impacts were identified in the final Guidelines (Appendix A) including the effects on:

- land users and owners;
- recreational land use;
- human health and safety;
- forest resources, forest protection and forest resource harvesting;
- wildlife and their supporting habitat;

- endangered species and their supporting habitat;
- fish resources and supporting habitat, recreational and other fisheries, and management activities;
- water and air quality;
- communities situated near the proposed transmission line;
- Crown and freehold land values;
- commercial agriculture;
- historical and archaeological resources; and
- present quarrying activity and future potential mineral extraction.

1.5 Study Strategy

In the final Guidelines (Appendix A), the Minister of Environment did not specify a particular EIA methodology but did indicate that the study should contain many of the elements described by Beanlands and Duinker (1983) as being basic to the EIA process. The approach used in this study embodies the conceptual framework for EIA recommended by Beanlands and Duinker (1983).

The conceptual framework for EIA recommended by Beanlands and Duinker (1983) is based on the perception that, to achieve its sociopolitical goals, the EIA process should be guided by the values and concerns of the public that might be affected by the project. Impacts that are perceived to be socially important must be identified early in the assessment process so that research efforts can be focused on those environmental components and potential interactions of greatest social and economic importance. As well, the advice of the scientific community should be sought to identify problems or interactions that are potentially serious, but of which the general public may not be aware. Together these inputs comprise part of an ecological and socioeconomic issue identification process (scoping) that is required for the identification of Valued Environmental Components. In this EIA study report, Valued Socioeconomic Components and Valued Ecosystem Components are referred to collectively as Valued Environmental Components.

Beanlands and Duinker (1983) stress the need to carry out EIA in accordance with a well-defined study strategy and to incorporate explicit criteria for defining the extent, nature, magnitude, and duration of impacts. It is also essential to identify spatial and temporal contexts or the boundaries that were placed on the EIA for political, administrative, ecological or technical reasons. As discussed later in Chapter Six it is also essential to consider socioeconomic reasons in the establishment of boundaries.

NB Power considers EIA to be both a regulatory requirement and a process that is continued through the life of the project. The EIA study report serves as a mechanism for the identification of effects on Valued Environmental Components and the development of mitigation strategy. As new information or data become available, impacts can be more clearly understood and mitigative procedures can be refined to further reduce the degree of impact. This continual process of project refinement and impact management is a major aspect of NB Power's strategy for resolving socioeconomic and ecological concerns associated with this project.

The study strategy used in the completion of this EIA Study involves 16 major steps in three phases (Figure 1-1):

- Phase 1, Route Selection;
- Phase 2, Issues Scoping; and
- Phase 3, Impact Assessment.

1.6 Study Area

The physical study boundaries for this EIA study report extend generally within a 15 km wide corridor from Salisbury to Newcastle, from Newcastle to Bathurst, and from Bathurst to Belledune, and the region between the latter two locations (Figure 1-2). The area of study, however, includes all those areas which could possibly experience significant impacts as a result of the proposed project and thus is not restricted to the spatial limits of the study corridor. Study boundaries are highly variable and have been selected to reflect the interaction of project activities with issues or species of concern. The study boundaries are discussed and described in detail in Chapter Three.

FIGURE 1-1: STUDY STRATEGY

PHASE I ROUTE SELECTION

- Select study corridor
- Describe biophysical/socioeconomic setting
- Public and local government consultation
- Identify routing constraints
- Analyze routing alternatives
- Select proposed and alternative routes

PHASE II ISSUES SCOPING

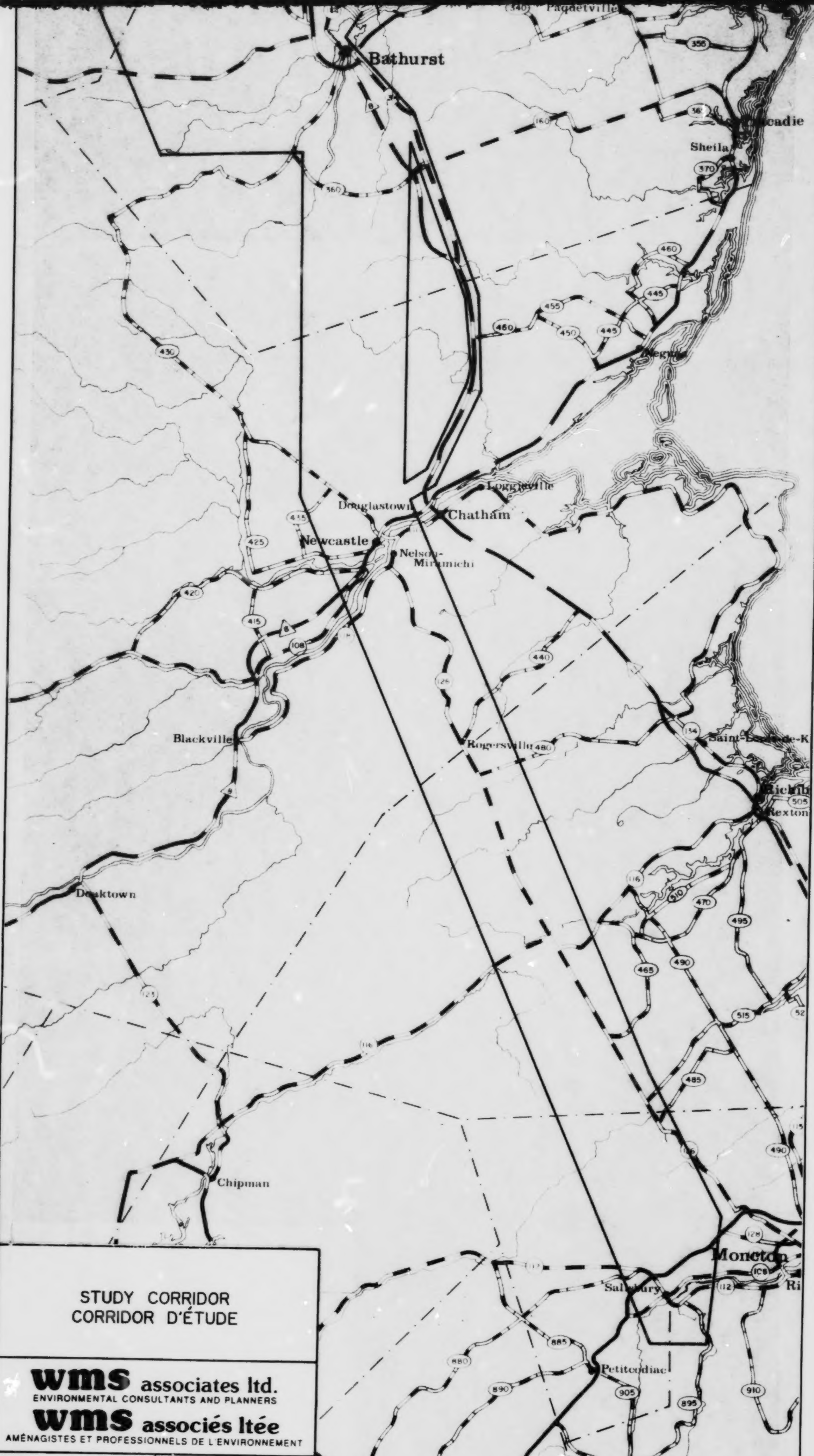
- Identify valued environment components
- Identify study boundaries

PHASE III IMPACT ASSESSMENT

- Develop detailed project description
- describe biophysical/socioeconomic setting of proposed route
- Analyze impacts
- Develop mitigation strategy
- Determine residual impacts
- Develop compensation strategy
- Develop monitoring strategy

PHASE IV IMPLEMENTATION

- EIA Review
- Obtain permits
- Negotiate compensation
- Construct facilities with mitigation, compensation and monitoring
- Operate facilities with mitigation, compensation and monitoring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STUDY CORRIDOR
CORRIDOR D'ÉTUDE

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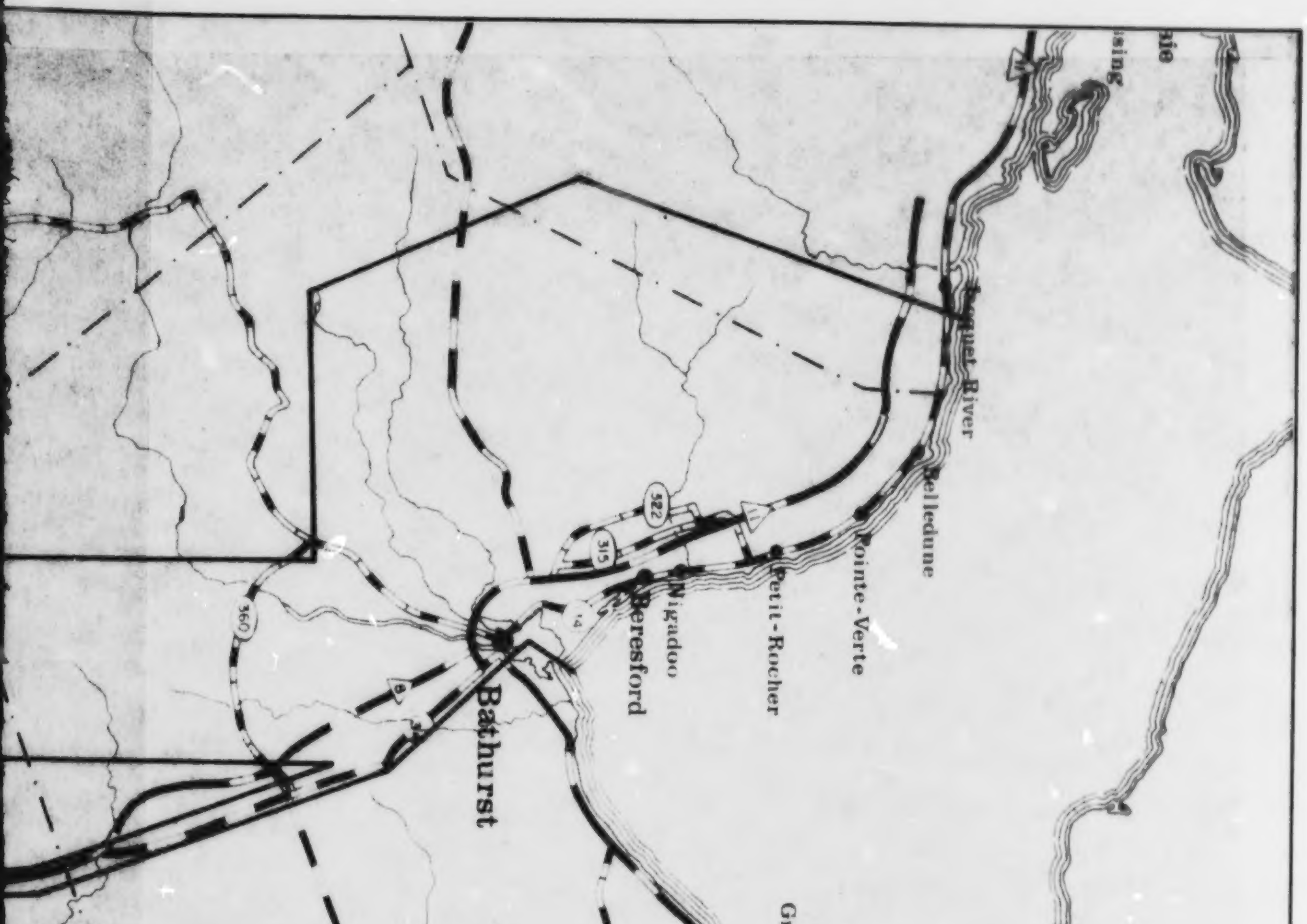
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1.7 Study Organization

This EIA study report is composed of eleven chapters, of which this introduction is the first. The rationale for and alternatives to the project are also presented in this chapter.

Phase I of this study, Route Selection, is an important aspect of the early planning of this project. Chronologically, it represents an important first step in the development of an environmentally acceptable project. Although not incorporated in the main text of this EIA report, the Route Selection Study has been incorporated in Appendix B. A brief overview of the Route Selection Study is included in Section 1.7.1.

Chapter Two presents the project description. This chapter provides a project synopsis and a detailed description of the location of transmission line characteristics, terminal station facilities, and the construction and operation phases of the right-of-way, the towers and the conductors.

Chapter Three develops the rationale for the selection of Valued Environmental Components for the EIA of the proposed route. A detailed discussion of the study boundaries is also provided.

Chapters Four and Five provides detailed biophysical and socioeconomic settings of the proposed route. The chapters also outline the character and status of Valued Environmental Components within the study boundaries.

Chapters Six and Seven assess the biophysical and socioeconomic impacts, respectively. The detailed analysis of all impacts, both positive and negative, is presented in the context of explicit criteria for rating the significance, geographical extent, frequency, and duration of impacts.

Chapter Eight presents the mitigation program that NB Power plans to implement to minimize adverse impacts and maximize project benefits. Where further work is required to develop mitigation, the required steps are clearly identified. The responsibilities of parties-at-interest, including NB Power, the public, and Provincial and federal agencies are outlined with regard to the establishment of mechanisms by which impacts and issues can be resolved as they emerge through the construction and operational phases of the project. Chapter Eight also summarizes the residual impacts of the project, i.e., those impacts that could occur even with the application of the mitigative measures. Following the determination of residual impacts, NB Power's strategy for compensation is presented. The monitoring program which NB Power intends to implement is also presented.

Chapter Nine discusses conclusions resulting from the EIA study.

Chapters Ten and Eleven provide lists of the references and personal communications cited in this report, including the position and affiliation of the individuals cited.

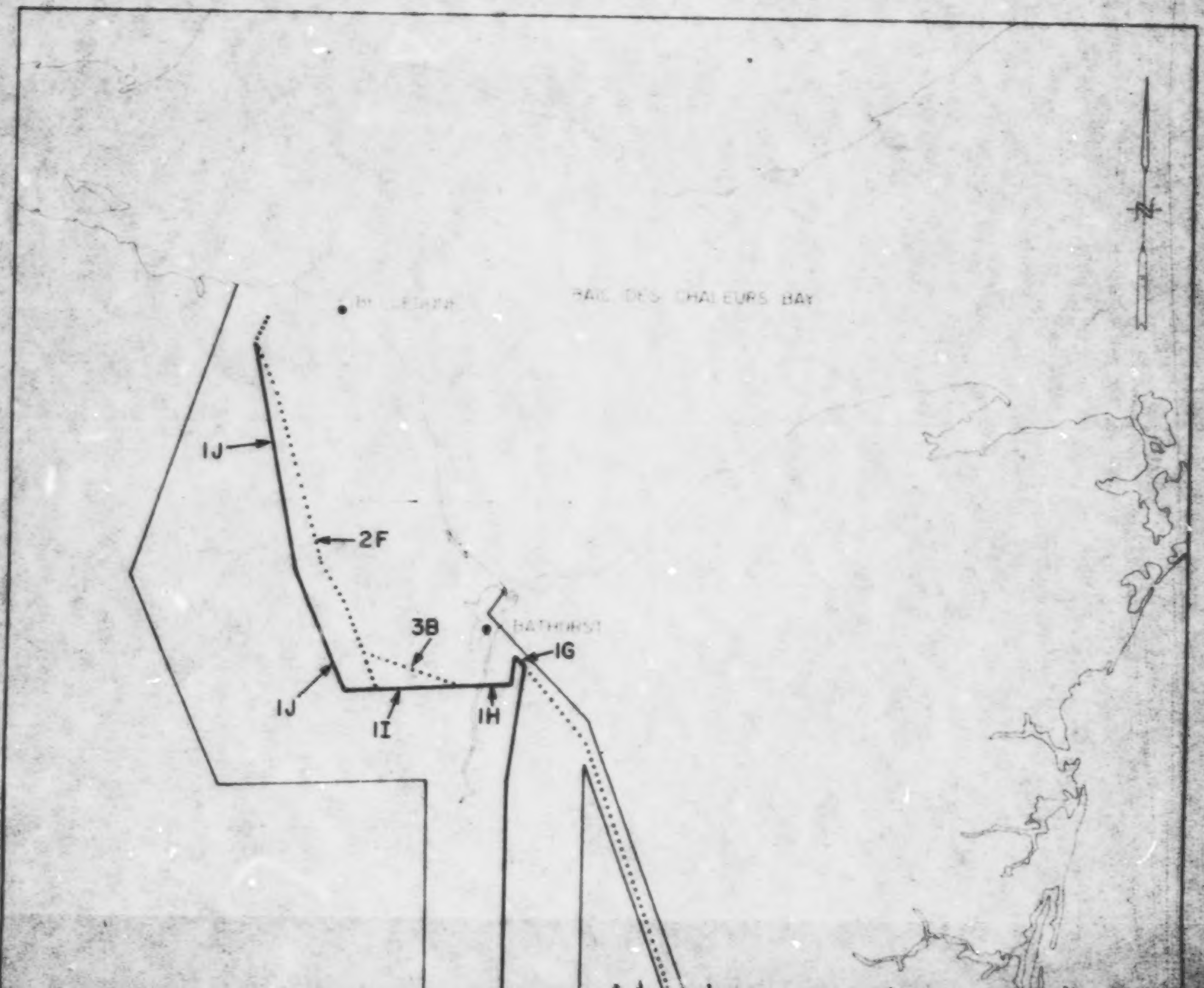
1.7.1 Route Selection Study

As noted in Section 1.7, the Route Selection Study was conducted to identify environmentally acceptable proposed and alternative routes.

The route selection process involved constraint mapping and selection of preliminary alternative routes to avoid sensitive areas and resources. The proposed and alternative routes were thus selected to minimize interaction with areas of constraint. A scoring system was used to compare the relative degree of interaction of various preliminary alternative routes. The proposed route showed the lowest score, and thus, the lowest degree of interaction with routing constraints. However, the proposed and alternative routes represent environmentally acceptable routes which satisfied prescribed routing objectives.

The proposed and alternative routes are shown in Figure 1-3. The route selection study is provided in Appendix B.

The Route Selection Study includes detailed biophysical and socioeconomic descriptions of the study corridor (Sections B.1 and B.2). The route selection methodology, analysis and results are provided in Section B.3. A detailed description and comparative analysis of the proposed and alternative routes are also provided.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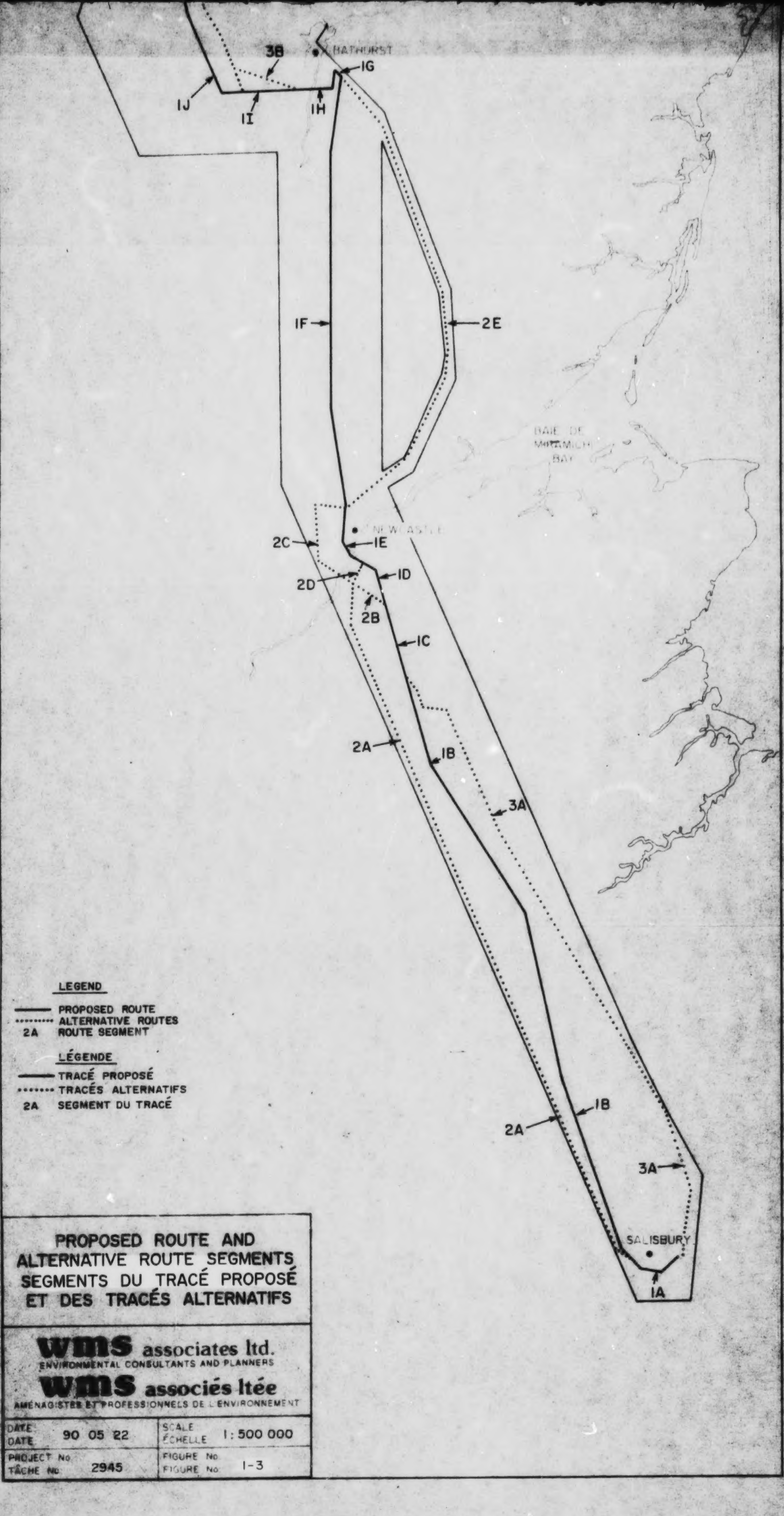
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PROPOSED ROUTE AND ALTERNATIVE ROUTE SEGMENTS
SEGMENTS DU TRACÉ PROPOSÉ ET DES TRACÉS ALTERNATIFS

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PROJECT DESCRIPTION

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2.0 PROJECT DESCRIPTION

2.1 Proposed Route

The southern end of the Proposed Route originates at the Salisbury Terminal Station near Salisbury, New Brunswick (Maps 1-8). It proceeds north, bypassing the Village of Salisbury to the west, and continues north to the west of Highway 126 to Barnaby River, where it crosses the Southwest and Northwest Miramichi Rivers to connect with the Newcastle Terminal Station (Maps 1 to 4).

The Proposed Route then proceeds north from Newcastle along the CNR rail line, paralleling line #2131, into the Bathurst Terminal Station on Route 11 (Maps 4 to 7). From Bathurst, the Proposed Route proceeds southwest, skirting the City, then north and to the west of Highway 11 to a point near Belledune where it connects with existing Eel River to Bathurst line (Maps 7 and 8). The connection to the proposed Belledune Terminal Station has been registered under the EIA process separately from this project.

The total length of line is approximately 241 km.

2.2 Transmission Facilities

The right-of-way of the proposed line will be 50 m in width with an additional 40 m being acquired for future use where the owner is agreeable. The centreline of the right-of-way will be surveyed for acquisition of rights to the land and engineering design. The right-of-way will be cleared, by public tender, to the full width of 50 m.

The structures for a 345 kV line are steel towers of two basic designs. The majority would be two-legged, guyed portal suspension towers (Figure 2-1) with an average height from ground to conductor of 23 m. Angle points in the line would require use of an anchor type tower (Figure 2-2) with an average height from ground to conductor of 18 m.

The tower foundations will consist of four steel grill footings per structure installed by excavating to a depth of 2.5 m, placing the footing in a predesigned geometric configuration, and backfilling and compacting the fill. Where rock is encountered, drilling and blasting or rock anchors will be required.

The span lengths between structures will be an average of 365 m. There will be three phases each spaced 10 m apart. Each phase will consist of two aluminum conductors in a bundle 40 cm apart. The minimum height from ground to conductor at low sag will be 9 m. There will be two galvanized overhead ground wires, at a spacing of 13 m.

2.3 Terminal Station Facilities

The existing terminals at Salisbury and Bathurst will be expanded to accommodate the termination of the line. At Newcastle, the line will pass through the existing Newcastle Terminal, providing for further connection, although no connection is to be made initially. The terminal at Belledune and its connection with the existing Eel River to Bathurst transmission line will be a new development required to connect the proposed Belledune Generating Station to the grid, and is being assessed as part of another project which has been registered separately under the **Environment Impact Assessment Regulation - Clean Environment Act**.

Approximately four or five additional people will be required to perform maintenance at these terminals; these positions will be filled by internal NB Power staff who will be given additional training. External hiring of apprentice linemen and electricians to replace those individuals transferred to terminal station maintenance is also expected to be necessary.

2.4 Communications System Facilities

Also required, in association with this line, is a microwave communication system to link Eel River, Belledune, Bathurst, Newcastle and Memramcook Terminals. This system will connect to NB Power's existing microwave system at Eel River and Memramcook. The communications system is required to properly protect the line by ensuring the line is cleared quickly from the system during faults.

2.5 Land Rights

The legislative base to generate electricity in the Province is the **Electric Power Act**. In exercising this statutory mandate of conducting and generating electricity, private property is often affected. When private property is affected by such works as lines, trenches, towers, ground rods, NB Power may use three types of agreements. These agreements are:

- a Transmission Line Agreement to Survey and Option for Easement;

- an Option (for Purchase) Agreement;
- and an Easement.

A copy of these agreements is provided in Appendix C.

The Transmission Line agreement authorizes NB Power to enter a private property and survey for a proposed transmission line. In addition, it also gives NB Power the option for an easement over these lands should it be decided that the proposed transmission line will cross the private property. The agreement sets out the appropriate rates for such an easement. Generally, these agreements are valid for one year, which allows NB Power the necessary time to complete the survey of the lands. However, if NB Power does not exercise the right to survey or grant an option for an easement within a specified time then the agreement is declared null and void.

With the Option agreement, NB Power purchases the property in fee simple free from all encumbrances. This type of an agreement is used when an easement is not sufficient and more land is required. Examples include, but are not limited to, land located where a sub-station site has been determined to be necessary, transmission line right-of-way traversing road frontage suitable for residential development or when the transmission passes directly over a residence. NB Power acquisition of a property is judged on a case-by-case basis. When NB Power purchases property the delivery of deed is not later than sixty days after the acceptance option. This agreement is binding upon acceptance and is registered on the title of the property at the Registry Office.

An easement gives NB Power the right to build towers, or transmission lines, or underground cables all for the purpose of conducting or transmitting electrical power. In addition to the authority to build, an easement also allows for the repair and maintenance of the aforementioned works. Under an easement NB Power fully compensates the land owner for any injury to property or crops for the purpose of surveying, building, repairing, or maintaining the transmission lines. However, the landowner retains ownership and may use this right-of-way for any activity (such as agriculture, Christmas trees, construction of roads, etc.) with the provision that such activities do not prevent NB Power from completing maintenance on the transmission line. An easement through Crown land does not entitle NB Power to the timber removed from the right-of-way during clearing; this accrues to the Crown timber license (B. Evered, pers. comm.).

2.6 Electric and Magnetic Fields

The magnetic and electric fields for the 50 m right-of-way have been calculated by NB Power (pers. comm.). On the centreline, the electric gradient will be 5.150 kV/m and the magnetic field will be 0.25 Gauss. At the edge of the right-of-way, these values will be 1.634 kV/m and 0.07 Gauss, respectively.

2.7 Ozone Levels

Ozone levels were calculated at peak levels for the condition of rain at a rate of 25 mm per hour and a horizontal wind of 0.6 m per second at the edge of the right-of-way the ozone level is calculated at 0.474 ppb (NB Power, pers. comm.). The maximum ozone level is within the right-of-way at a level of 0.583 ppb 19 m downwind of the centreline.

2.8 Induced Currents and Voltages

Electric and magnetic fields are phenomena that exist around all energized transmission lines. Electric fields are present because of the electric charge on the transmission line conductors. These fields will induce a voltage on conductive objects which are in the influence of the field. Any person who contacts the conductive object may experience a tingle or spark similar to static picked up from a rug. Two examples are a vehicle parked under the line or a metal building near the transmission line. These induced voltages can be simply mitigated by grounding the metal building or placing grounding chains on the vehicle.

Unlike electric fields, magnetic fields are present whenever a current is flowing in the transmission line. These alternating magnetic fields will cause a current to be induced in conductive objects such as a pipeline, irrigation system or fence which runs parallel to the transmission line. One method of mitigating the induced currents would be to ground the object in several locations.

Both electric and magnetic fields decrease rapidly in strength as we move away from the source. Therefore, the conductive objects must be close to the transmission line in order to be affected by the fields.

2.9 Rationale for Width of Right-of-way

When calculating right-of-way width the main factors considered are conductor swing-over and tree falling distances.

The conductors of a transmission line are not rigid and will move. These movements are calculated and the right-of-way must be wide enough to maintain safe electrical clearances at all times.

Trees adjacent to the right-of-way are subject to falling. The right-of-way must be wide enough to ensure that falling trees do not contact the line conductors or cause outages of the line.

2.10 Aesthetics

Where possible, the preferred route has been located so as to avoid areas of particular aesthetic importance such as parks and important natural areas and vistas. While the towers and the right-of-way will be visible in places, steps will be taken to minimize the aesthetic impact. These steps include avoiding "sky lighting" of the line, avoiding extensive distances along the length of heavily used valleys and the provision of greenbelts at places where the right-of-way meets roads or streams. The effectiveness of these greenbelts varies with topography and vegetation, however, the general guideline of 45 m used by NB Power in clearing, normally affords screening from adjacent roads.

2.11 Construction

2.11.1 Transmission Line

2.11.1.1 Schedule

The transmission line will be constructed in three segments:

- Salisbury to Newcastle;
- Newcastle to Bathurst; and
- Bathurst to Belledune.

Each segment is divided into three distinct construction activities;

- survey of the centreline;
- clearing of the right-of-way; and
- construction of the towers and conductors.

The line segment between Salisbury and Newcastle will be constructed on the following schedule subject to EIA approval:

- the survey of the centreline commenced in February, 1990 and is scheduled for completion by September 30, 1990;
- clearing is planned to commence in October, 1990, and be completed November 30, 1990; and
- line construction is planned to commence November 1, 1990, and be completed November 30, 1991.

The line segment between Newcastle and Bathurst will be constructed on the following schedule:

- survey of the centreline is planned to commence September 1, 1990 and be completed January 31, 1991;
- clearing is planned to commence about April 1, 1991 and be completed September 30, 1991;
- line construction is planned to commence May 1, 1992 and be completed August 31, 1992.

The section of line between Bathurst and Belledune will be constructed at a later date, possibly in 1997.

2.11.1.2 Construction Procedure

The construction of the line will begin at Salisbury and progress northward. At the outset, a schedule will dictate the number of structures to be delivered to a particular temporary steel yard. When that phase is completed, the whole operation moves to the next yard and continues. At this time, current staff are encouraged to remain for the time required to train new staff hired from the local area. However, some personnel, such as equipment operators and supervisors, are employed for the entire transmission line construction period.

The procedures included in the construction of a 345 kV transmission line are as follows:

- selection of steel yards approximately 40 to 60 km apart near main highways where labour is available and a temporary field office can be established;
- a material delivery schedule to assure timely supply to field construction personnel;
- preparation of manpower requirements specifying labour and skilled trades;
- sorting of delivered material in the yard into packages for delivery to the line, and assurance that the correct material goes to the proper sites;
- field staking of tower sites;
- access roads to be bulldozed prior to the hauling of steel to sites on line;
- footing crews will pre-assemble and install tower and anchor footings;
- pre-assembled tower sections will be delivered from steelyard to structure sites;
- field crews will assemble towers at the sites; layout will be on the ground or on cribwork;
- the tower erection crew will pre-cut and install guys and raise the tower into position either by crane or by a falling "A" frame gin pole; anchor towers will be assembled in panels and raised into position by crane;

- overhead groundwire will be installed;
- conductors are installed;
- spacers will be installed on the bundled conductors by the use of carts which are propelled along the wires; and
- backfilling and cleanup.

Throughout the construction phase, the field staff will maintain cordial relations with the landowners and local suppliers of services as well as NB Power District Offices. This will assure timely expedition of requests for information or damage claims. Environmental protection procedures during the construction phase of this project are shown in Appendix C, Generic Environmental Protection Plan.

2.11.1.3 Access

During construction, access to the right-of-way will be achieved in the following priority:

- directly from existing highways and secondary roads;
- directly from existing forest and other resources access roads; and
- where necessary, by constructing new access roads.

The number of new roads constructed will be kept to a minimum. Routes will be selected to avoid sensitive terrain or resources and watercourses. Except where necessary to avoid fording of an important watercourse, it is desirable to have access roads to the right-of-way at approximately 8 km intervals.

Travel along the proposed right-of-way will be achieved in the following order of priority:

- using existing access/roads along adjacent transmission lines, where paralleled;
- travel along the proposed right-of-way, except in sensitive terrain;

- by accessing sensitive terrain or watercourses from both directions, or by using existing off right-of-way access roads; and
- by creating new access roads selected to avoid sensitive terrain or watercourses.

2.11.1.4 Restoration

During the clearing operation, the contractor hired by NB Power will remove all merchantable timber or pile it on the right-of-way where it will not interfere with construction. It is the intent to have as much wood as possible totally removed from the right-of-way. The contractor will compact the waste material to NB Power specifications to accelerate breakdown, and improve the appearance of the right-of-way generally.

The contractor will take all necessary precautionary measures as recommended in the statutes of New Brunswick, and stated in the Generic Environmental Protection Plan articulated by NB Power (Section 8.1.3).

Approximately one year after completion of the line, personnel and equipment will traverse the entire line re-backfilling tower footings, repairing construction damage where necessary, replacing access roads and fencing and general housekeeping on the right-of-way. A broadcast application of herbicide will be applied during the first two years of the existence of the new right-of-way to establish control of the deciduous species which sucker and sprout from the cut stubble remaining after initial clearing.

2.11.1.5 Personnel Requirements

The project will be managed by NB Power during all phases of construction. The majority of the work will be conducted by NB Power employees supplemented by a locally-sourced temporary workforce. However, clearing is typically contracted.

Various types of labour skills will be required during this phase, including surveyors, foremen, clerks, lead hands, tractor, crane, truck and backhoe operators, and labourers.

For the Salisbury to Newcastle segment of the proposed route, the estimated personnel requirements are as follows:

- surveying - two crews of six members each;

- clearing - approximately 28 crews each with three members, and four foremen; and
- construction - 250 to 300 workers.

The total estimated personnel requirements for the Salisbury to Newcastle segment is 1,170 person weeks.

Personnel requirements for the Newcastle to Bathurst segment of the proposed route are:

- surveying - approximately one crew of six members;
- clearing - approximately two crews of three members each and two foremen; and
- construction - 125 to 150 workers.

The total estimated personnel requirements for the Newcastle to Bathurst segment is 420 person weeks.

At this point in time, labour requirements have not been estimated for the Bathurst to Belledune segment of the route.

It should be noted that the length of employment and the number of positions available may vary with the length of the construction season, i.e., for a shorter season, more persons will be required but for a shorter period of work. The length of the construction season is dependent on the weather.

2.11.1.6 Equipment Rental

Equipment rentals for the Salisbury to Newcastle segment of the proposed transmission line route are as follows:

- 3 excavators for 6 months;
- 4 storage trailers for 8 months;
- 4 air compressors for 6 months;

- 2 boom trucks for 6 months;
- 2 office trailers for 8 months;
- 2 large tractors for 6 months;
- 4 portable toilets for 8 months;
- 20 crew cab trucks for 8 months; and
- 10 1/2 ton trucks for 8 months.

For the Newcastle to Bathurst Segment of the proposed route, the same amount of equipment will be rented, but for approximately half the amount of time as above. The amount and duration of equipment rentals for the Bathurst to Belledune portion of the route are not known at the present time.

2.12 Operation

NB Power employees will periodically patrol the line by air and ground to identify remedial work needed to ensure reliable and safe operation of the line. Tracked equipment will commonly be used for access to and along the right-of-way for repairs to the structures and hardware. These access roads will be maintained to a standard required by these off-road vehicles.

2.12.1 Vegetation Control

NB Power has 6,400 km of transmission lines covering approximately 20,235 ha, of which 2,428 to 2,833 ha require annual maintenance, i.e., vegetation control. NB Power now practices three forms of vegetation control (at an estimated annual cost of $1,050,000):

- 50 percent mechanical, by use of four hydro-axes which clear approximately 1,416 ha/year at a cost of $370+/ha;
- 25 percent hand clearing, by use of chain saws which clear approximately 607 ha/year at a cost of $395 to $420/ha; and

- 25 percent application of foliar sprays, which clear approximately 607 ha/year at a cost of $321 to $346/ha.

NB Power has a 20-year maintenance plan which involves many interacting factors, including:

- terrain;
- line clearance (vertical and horizontal); and
- species composition in a particular section of right-of-way.

Vegetation control is carried out in five to seven year cycles. Clearance from vegetation to conductors dictates the cutting cycle, while terrain is an important factor in determining the type of control used. Hydro-axes require long stretches of fairly regular terrain, and hand removal requires woodsmen experienced with using chain-saws. Foliar sprays perform best on selected terrains such as right-of-ways which are located on sides of hills and over short lines of 20 to 40 ha. Foliar sprays are usually applied after three cycles (five to seven years each), as stem densities are by that time usually too large to safely use any other type of removal. Once the foliar spray has been applied, the other two forms of maintenance may be used for another three cycles. NB Power has estimated that foliar spray will be applied to approximately 526 ha in 1990, and has been promoting procedures other than the use of foliar sprays for its line clearing efforts. NB Power has a set of practices which are observed by both NB Power personnel and the contractors hired to control vegetation on right-of-ways. The practices involve the application of the herbicides TORDON 101 or DYCLEER following label instructions and specifications set out under the **Pesticides Control Act** and the **Clean Environment Act**.

NB Power completes one broadcast application of foliar spray along the entire length of a right-of-way, one to two years after construction of a new transmission line has been completed. This initial application is to gain an early advantage over deciduous suckering and sprouting species.

Sensitive areas such as watersheds and other watercourses are flagged. In addition, for each transmission line right-of-way, NB Power keeps on file all property owners who have requested that foliar sprays not be used for maintenance but makes the suggestion that the property owner be responsible for maintaining vegetation control. Should the property owner not comply with this suggestion, NB Power personnel or their contractors will conduct any required maintenance activity using chain-saws.

Upon determining the need for the use of a foliar spray, NB Power submits a permit application and map to the New Brunswick Department of the Environment.

Foliar sprays are applied from approximately June 1 (once foliage is out) to the end of August. Procedures are the same whether the land is private or Crown Land. NB Power requires the contractors to be indemnified and sign a one-year bond, and established in the tender specifications those areas which are to be sprayed. NB Power personnel are on site at all times with contractors to ensure limits are not exceeded.

Procedures which are followed by NB Power in order to minimize any adverse effects upon the environment include:

- no foliar spray is applied without written approval of the Minister of the Environment, pursuant to the **Pesticides Control Act** and the **Clean Environment Act**;
- chemical application is performed under the strict supervision of a licensed applicator as defined in the **Pesticides Control Act**; and
- herbicides are not applied under any of the following conditions,
    - within 30 m of the boundary of a park or any other public area,
    - on private property unless permission is obtained from the owner,
    - along any portion of the right-of-way which is within 100 m of any permanent residence without the permission of the owner,
    - within 25 m of any watercourse where the slope is less than or equal to 20 percent, or within 50 m of any watercourse where the slope is greater than 20 percent, or
    - on any vegetation which is more than one metre in height and which is within view of a public road or highway.

Storage and handling of foliar sprays is conducted in a manner which minimizes or prevents spills. Disposal of empty containers is done at disposal sites authorized for such materials.

NB Power employees and contractors will at all times take all necessary precautionary measures as recommended in the statutes of New Brunswick and Canada.

CHAPTER THREE

VALUED ENVIRONMENTAL COMPONENTS AND STUDY BOUNDARIES

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3.0 VALUED ENVIRONMENTAL COMPONENTS AND STUDY BOUNDARIES

This chapter outlines the selection process for the identification of Valued Environmental Components, and provides a list of Valued Ecosystem Components and Valued Socioeconomic Components. The boundaries for the EIA study are also discussed.

3.1 Valued Ecosystem Components

Beanlands and Duinker (1983) reported that an essential part of the EIA process is the identification of the Valued Ecosystem Components. They noted:

> **It is impossible for an impact assessment to address all potential environmental effects of a project. Therefore, it is necessary that the environmental attributes considered to be important in project decisions be identified at the beginning of an assessment. This will normally require some form of public consultation or social scoping exercise to determine the values attached to various ecosystem components. Both the views expressed by the general public and those of the professional community should be considered when determining these values.**

The Route Selection Study (Appendix B) considered, at the study corridor level, those Valued Environmental Components which were apparent and could be identified spatially for the purposes of avoidance. However, to conduct a detailed EIA, it is necessary to identify the specific interactions of the proposed route, and project facilities and activities with Valued Environmental Components.

During the present study, selection of Valued Ecosystem Components was achieved through consultation, meetings, and correspondence with government agencies, government and university researchers, resource user groups, local government representatives and the public. The final Guidelines specifically identified the importance of fish and wildlife for this EIA Study. This was further substantiated by the input of the public during the public consultation process (Appendix G).

The final selection of Valued Ecosystem Components was based on four criteria:

- identification in the EIA Guidelines;
- identification in the public consultation process;

- professional concern; and

- economic importance to the people of each area.

All of the Valued Ecosystem Components selected on the basis of these criteria are species of fish and wildlife, or ecosystem components, i.e., water quality and air quality. In the case of avifauna, species were grouped, except for bald eagle and osprey, reflecting their diversity in socioeconomic importance and social value, and diversity in habitat requirements.

The list of Valued Ecosystem Components considered was amended as information was obtained during the public consultation and data collection phases of the EIA study. A number of species initially considered were later deleted or grouped as it became evident their economic or social value did not warrant their inclusion. As well, some species or species groups that were not identified as Valued Ecosystem Components are considered indirectly during the impact analysis because of their interrelationships with Valued Ecosystem Components. For example, although cricetid rodents and other small mammals were not selected as Valued Ecosystem Components, they provide an important prey base for marten and some species of avifauna. In evaluating the impacts of project activities on Valued Ecosystem Components it was necessary to consider the potential effects of those activities on important prey species. Similarly, vegetation species are not recognized as Valued Ecosystem Components, although the value of vegetation as habitat for key wildlife species and its importance in terms of resource harvesting was considered during the impact analysis for Valued Ecosystem Components and Valued Socioeconomic Components. A list of the Valued Ecosystem Components and the selection criteria used to select them are provided in Figures 3-1 and 3-2.

3.2 Valued Socioeconomic Components

The socioeconomic issues of greatest concern to those who may be affected by the project were identified during the initial stages of the EIA Study, coincident with the selection of Valued Ecosystem Components. The selection of important socioeconomic issues and concerns were based on three criteria:

- identification in the EIA Guidelines;

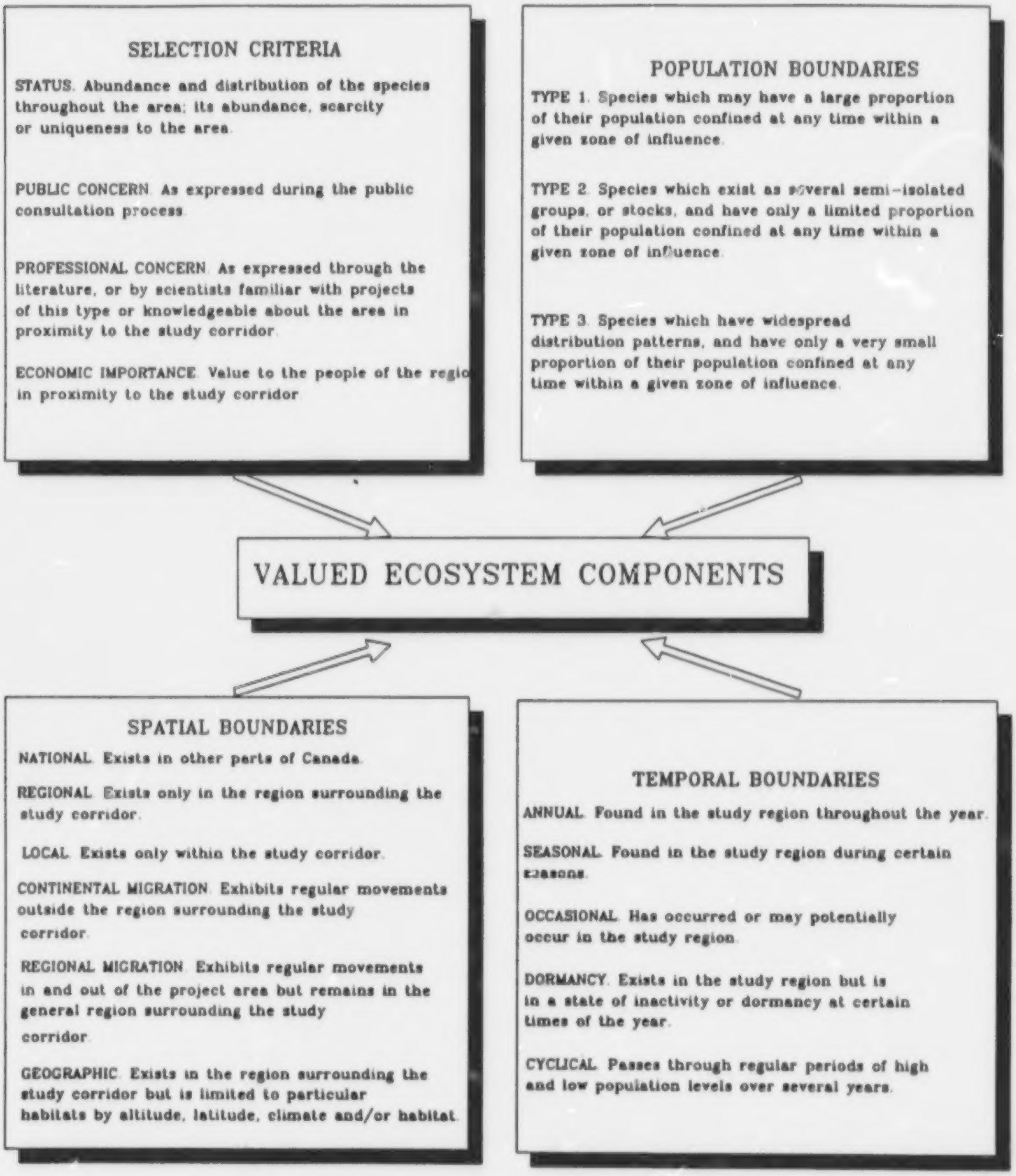
- identification in the public consultation process; and

- professional concern.

Figure 3-1 Valued Ecosystem Components, Boundaries and Criteria for Selection

	Selection Criteria				Population Boundaries			Spatial Boundaries						Temporal Boundaries				
Valued Ecosystem Components	EIA Guidelines	Public Concern	Professional Concern	Economic Importance	Type 1	Type 2	Type 3	National	Regional	Local	Continental Migration	Regional Migration	Geographic	Year Round	Seasonal	Occasional	Dormancy	Cyclical
Mammals																		
White-tailed Deer	o	o	o	o			o	o						o				o
Moose	o		o	o			o	o						o				
Marten	o		o	o		o		o					o	o				o
Avifauna	o		o	o		o	o	o	o		o			o	o			
Fish																		
Atlantic Salmon	o	o	o	o		o			o		o		o		o			
Brook Trout		o		o			o	o				o	o	o				
Endangered Species																		
Eastern Cougar	o		o	o		o		o					o	o				
Lynx	o		o	o			o	o					o	o				
Bald Eagle	o	o	o	o	o	o	o	o			o		o		o			
Osprey	o	o	o	o	o	o	o	o			o		o		o			
Water Quality	o	o	o	o					o					o				
Air Quality																		
Ozone	o		o	o					o					o				

Figure 3-2: Criteria for the Selection of Valued Ecosystem Components and Definition of Ecological Boundaries



SELECTION CRITERIA

STATUS. Abundance and distribution of the species throughout the area; its abundance, scarcity or uniqueness to the area.

PUBLIC CONCERN. As expressed during the public consultation process.

PROFESSIONAL CONCERN. As expressed through the literature, or by scientists familiar with projects of this type or knowledgeable about the area in proximity to the study corridor.

ECONOMIC IMPORTANCE. Value to the people of the regio in proximity to the study corridor.

POPULATION BOUNDARIES

TYPE 1. Species which may have a large proportion of their population confined at any time within a given zone of influence.

TYPE 2. Species which exist as several semi-isolated groups, or stocks, and have only a limited proportion of their population confined at any time within a given zone of influence.

TYPE 3. Species which have widespread distribution patterns, and have only a very small proportion of their population confined at any time within a given zone of influence.

VALUED ECOSYSTEM COMPONENTS

SPATIAL BOUNDARIES

NATIONAL. Exists in other parts of Canada.

REGIONAL. Exists only in the region surrounding the study corridor.

LOCAL. Exists only within the study corridor.

CONTINENTAL MIGRATION. Exhibits regular movements outside the region surrounding the study corridor.

REGIONAL MIGRATION. Exhibits regular movements in and out of the project area but remains in the general region surrounding the study corridor.

GEOGRAPHIC. Exists in the region surrounding the study corridor but is limited to particular habitats by altitude, latitude, climate and/or habitat.

TEMPORAL BOUNDARIES

ANNUAL. Found in the study region throughout the year.

SEASONAL. Found in the study region during certain seasons.

OCCASIONAL. Has occurred or may potentially occur in the study region.

DORMANCY. Exists in the study region but is in a state of inactivity or dormancy at certain times of the year.

CYCLICAL. Passes through regular periods of high and low population levels over several years.

These socioeconomic issues and concerns were used to identify the Valued Socioeconomic Components; these components and the selection criteria used to select them are provided in Figures 3-3 and 3-4.

Socioeconomic issues and concerns were further identified and refined through the public and local government consultation process conducted as part of this EIA study (Appendix G and Section B.3.5). During the issues scoping phase of this EIA study, information sessions were held with the following groups:

- local government representatives including Local Service District Advisory Committee members and elected representatives of incorporated municipalities;
- the general public; and
- special interest groups and associations.

The objective of the local government representative information sessions and open house sessions was to provide these groups with information on the nature of the project, an opportunity to identify concerns for the Route Selection Study and to assist in the identification of Valued Environmental Components for the EIA study. Given this knowledge, information on the current public use of the proposed transmission lines and the specific nature of issues and concerns were solicited. The major public issues identified during these meetings were concerns relating to:

- access to the proposed right-of-way;
- public health and safety;
- the effect of the proposed transmission line on resources from an environmental and an economic point of view; and
- economic benefits, losses and compensation.

The public consultation process indicated that the project is of some public concern and that some public concerns extend beyond the physical boundaries of the proposed transmission line boundaries.

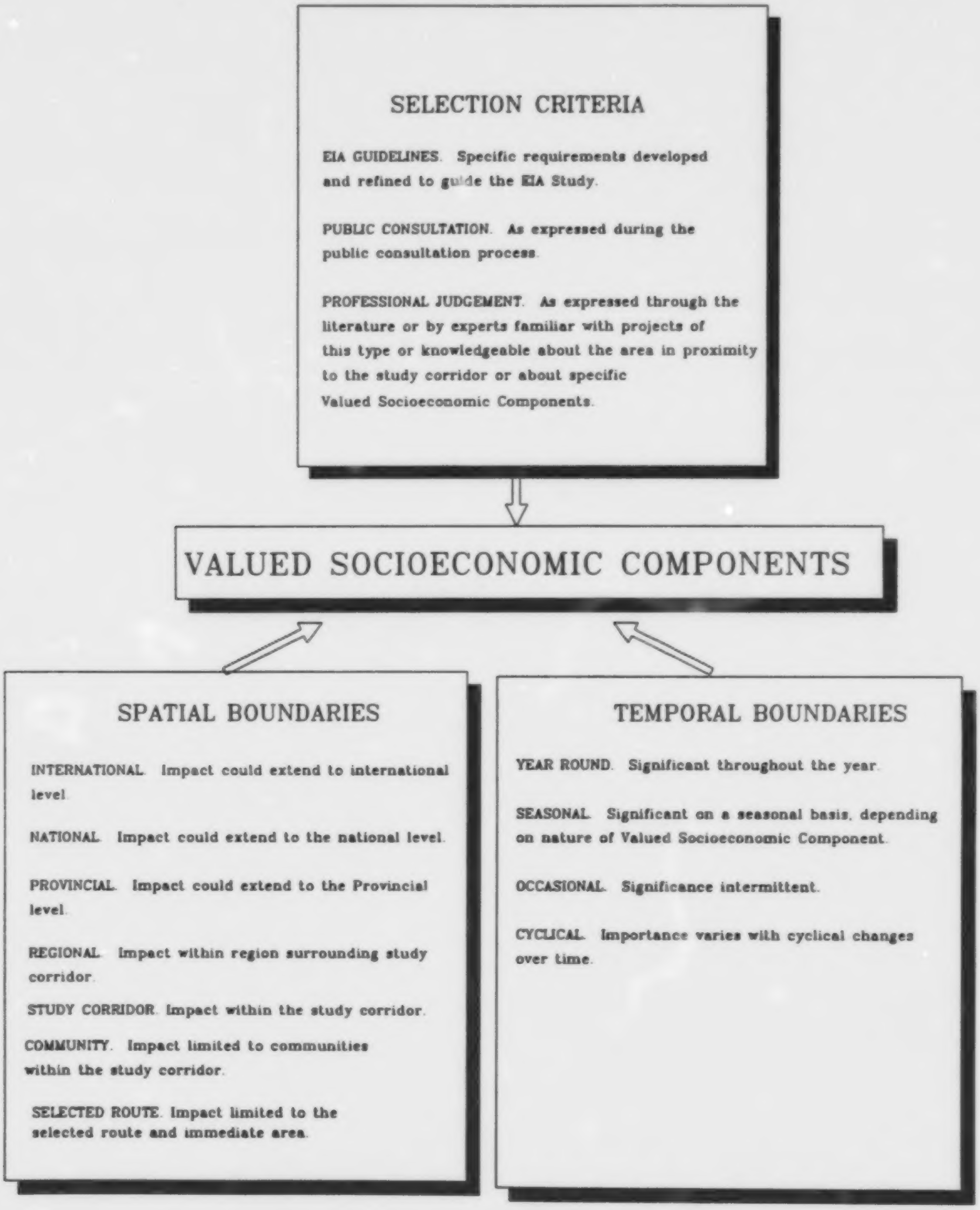
Fig. 3-3 Valued Socioeconomic Components, Boundaries and Criteria For Selection

	Selection Criteria			Spatial Boundaries							Temporal Boundaries			
VALUED SOCIOECONOMIC COMPONENTS	EIA Guidelines	Public Consultation	Professional Judgement	International	National	Provincial	Regional	Community	Study Corridor	Selected Route	Year Round	Seasonal	Occasional	Cyclical
Land Use														
Recreational Use														
Sport Fishing	o	o	o	o	o	o	o	o	o	o		o		
Hunting	o	o	o	o	o	o	o	o	o	o		o		
Snowmobiling	o	o	o			o	o	o	o	o		o	o	
Cross Country Skiing	o		o			o	o	o	o	o		o	o	
Canoeing	o					o	o	o	o	o		o	o	
Camping	o		o			o	o	o	o	o		o	o	
Commercial Use														
Forestry	o	o	o			o	o	o	o	o	o	o	o	
Agriculture	o	o	o						o	o		o		
Mining and Mineral Resources	o	o	o						o	o	o		o	
Trapping	o		o						o	o	o	o	o	
Airports	o	o	o		o	o	o	o	o	o	o			
Outfitting	o	o	o	o	o	o	o	o	o	o		o	o	
Maple Sugar			o						o	o		o	o	
Fox Farms			o				o	o	o	o	o	o		
Communities	o	o	o				o	o	o	o	o			
Land Status														
Land Value	o	o	o						o	o	o			
Land Rights	o	o	o							o	o			

Fig. 3-3 Valued Socioeconomic Components, Boundaries and Criteria For Selection (Continued)

	Selection Criteria			Spatial Boundaries							Temporal Boundaries			
VALUED SOCIOECONOMIC COMPONENTS	EIA Guidelines	Public Consultation	Professional Judgement	International	National	Provincial	Regional	Community	Study Corridor	Selected Route	Year Round	Seasonal	Occasional	Cyclical
Public Health and Safety														
Electric and Magnetic Fields	o	o	o					o		o	o			
Aviation		o	o	o	o	o	o	o	o	o	o			
Herbicides		o	o					o		o		o		
Induced Current		o	o	o						o	o			
Communications	o	o	o					o		o	o			
Historic and Archaeological Resources	o		o							o	o			

Figure 3–4 Criteria for the Selection of Valued Socioeconomic Components and Definition of Socioeconomic Boundaries



SELECTION CRITERIA

EIA GUIDELINES. Specific requirements developed and refined to guide the EIA Study.

PUBLIC CONSULTATION. As expressed during the public consultation process.

PROFESSIONAL JUDGEMENT. As expressed through the literature or by experts familiar with projects of this type or knowledgeable about the area in proximity to the study corridor or about specific Valued Socioeconomic Components.

VALUED SOCIOECONOMIC COMPONENTS

SPATIAL BOUNDARIES

INTERNATIONAL. Impact could extend to international level.

NATIONAL. Impact could extend to the national level.

PROVINCIAL. Impact could extend to the Provincial level.

REGIONAL. Impact within region surrounding study corridor.

STUDY CORRIDOR. Impact within the study corridor.

COMMUNITY. Impact limited to communities within the study corridor.

SELECTED ROUTE. Impact limited to the selected route and immediate area.

TEMPORAL BOUNDARIES

YEAR ROUND. Significant throughout the year.

SEASONAL. Significant on a seasonal basis, depending on nature of Valued Socioeconomic Component.

OCCASIONAL. Significance intermittent.

CYCLICAL. Importance varies with cyclical changes over time.

3.3 Study Boundaries

An important aspect of the environmental assessment process is the determination of the study boundaries. Beanlands and Duinker (1983) recognized four types of temporal and spatial boundaries that should be considered in developing a study design and carrying out an EIA:

- project boundaries;
- administrative boundaries;
- ecological boundaries; and
- technical boundaries.

For methodological consistency, socioeconomic boundaries have been added for this EIA study as recommended by WMS (1990a). Socioeconomic boundaries refer to the time and space scales over which social and economic systems function within the context of the socioeconomic environment. Criteria for the Selection of Valued Ecosystem and Socioeconomic Components and definition of ecological and socioeconomic boundaries are presented in Figures 3-1, 3-2, 3-3 and 3-4.

3.3.1 Project Boundaries

Project boundaries refer to the time and space scales over which the project extends. Project boundaries are dictated primarily by the requirements of NB Power. Temporally, use of the transmission line is expected to last at least 20 years. Within each year, there are further temporal project boundaries such as the timing of construction and maintenance activities, or the limitations imposed by seasons.

Spatial project boundaries are based on a number of logistical, tactical and safety considerations. To ensure operational effectiveness, the transmission line should be located within a right-of-way extending between Salisbury, Newcastle, Bathurst and Belledune. Technically, the project requires a right-of-way 50 m in width, with no tall vegetation and no adjacent tall trees ("danger trees").

In meeting the basic requirements of the proposed transmission line, a considerable degree of flexibility exists for the establishment of boundaries for the proposed line. During the EIA process to date, this degree of flexibility has provided an opportunity to adjust proposed project boundaries to minimize potential socioeconomic and ecological interactions by selecting a Proposed Route which avoids interaction with constraints. However, the locations of the beginning and end points of the line at Salisbury, Newcastle, Bathurst and Belledune were fixed at the existing and proposed terminal stations.

The proposed route of the transmission line (Figure 1-3) reflects the degree of refinement that was possible at the Route Selection stage of the EIA process. From both a biophysical and resource use standpoint, NB Power's ability to further minimize potential negative interactions by adjusting internal or external project boundaries is limited by the level of information currently available for these areas.

Duinker (1985) discusses the concept of resolution in relation to the establishment of temporal and spatial boundaries. That is, what time and space intervals are appropriate for the EIA? In terms of temporal project boundaries, the intervals considered are quite broad, i.e., project construction, operation and accidental events. This is because some project activities are assumed to be constant over the life of the project. For certain specific project activities such as line maintenance, the intervals may be measured in days, in others, such as construction of the right-of-way and the towers, the intervals may be months. Similarly, in terms of space, the intervals or units used to define the project boundaries vary among Valued Environmental Components.

3.3.2 Administrative Boundaries

Administrative boundaries are time and space limitations imposed on the assessment for political, social or economic reasons. The proposed transmission line lies wholly within New Brunswick, and consequently most of the resources that might be affected by the project are administered through the laws and statutes of the Province of New Brunswick. Provincial departments with direct administrative mandates for human or natural resources within the proposed transmission lines include the Departments of Natural Resources and Energy, Environment, Fisheries, Transportation, Municipal Affairs, Health and Community Services, and Tourism, Recreation and Heritage. The mandate of these Departments are managed under a diversity of administrative boundaries. These can include areas such as parishes and counties, but often include arbitrary administrative zones which fulfil the specific needs of the administrative body.

While most of the resources that might be affected by the development of the proposed transmission line are administered at a Provincial level, management of waterfowl and fisheries resources involves certain other administrative jurisdictions. Management of waterfowl and other migratory birds is carried out in accordance with international agreements (**Migratory Birds Convention Act**, North American Waterfowl Management Plan) between Canada and the United States, for which the administrative body is the Canadian Wildlife Service, a division of Environment Canada. Fisheries resources in New Brunswick, depending on the species and stock, are managed by both Fisheries and Oceans Canada and New Brunswick DNRE.

Although the majority of the land encompassed by the proposed transmission line is Provincial Crown land, certain tracts of land have been leased for recreational, resource use or research purposes. These Crown leases, which include campsite, agriculture, institutional, timber and sugar bush leases, are described in Chapter Four. Further, large areas of land are freehold.

An important temporal administrative boundary was the time available for conducting this EIA study. To meet the planned project schedule, the EIA study, which was registered in January 1989, and had to be completed by May 1990. To complete the EIA within this seventeen month period, a study design had to be devised which was based primarily on the use of existing information and public consultation. Field investigations were limited to reconnaissance level surveys intended to familiarize study team members with environmental conditions within the study corridor, with the exception of a survey for rare and endangered plant species.

3.3.3 Ecological Boundaries

Ecological boundaries refer to the time and space scales over which natural systems function. Ecological time boundaries can be established on the basis of a variety of temporal characteristics of natural systems. Such factors include:

- the magnitude, periodicity and trends in the natural variation of the population or ecological system;
- the time required for a biotic response to become evident; and
- the time required for a population or ecological system to recover from a perturbation to its pre-impact state.

The time scales that need to be considered in assessing impact vary widely among species. For example, the levels of temporal resolution may involve days or weeks when considering the possible impact of project activities during wildlife breeding periods or fish spawning. Other processes may be of seasonal or longer duration. Because of the time scales associated with vegetation succession, impacts on plant communities may extend over many decades.

Certain species of animals undergo intrinsic population cycles, characterized by gradual population increases and rapid population declines. The intervals of these cycles vary from three to four years for certain species of microtine rodents to about ten years for species such as snowshoe hare, lynx and ruffed grouse. In examining the impact of a project on cyclic species it is important, although often difficult, to distinguish between population changes that might be impact related and changes that occur as a result of the natural periodicity of the population.

The degree of impact of a perturbation on a particular species also depends on other ecological characteristics including, the proportion of the year that the species remains in the proposed right-of-way, the timing of sensitive life history periods in relation to the schedule of proposed activities, and whether the annual activity cycle of the species includes a period of dormancy. For example, the majority of the bird species in the study area are migratory and would only be exposed to potential sources of impact for approximately half of the year. In dealing with time boundaries for impact assessment, there is a need to consider intervals that are biologically meaningful with respect to the life cycle of the species being considered.

Spatial ecological boundaries influence the likelihood that impacts on ecological systems could extend beyond the boundaries of the project area. Migratory bird and anadromous fish populations are frequently considered vulnerable, since deterioration or loss of breeding habitat could influence population levels and resource use over extensive areas. In eastern North America, moose and white-tailed deer populations are generally considered to be non-migratory, although both species exhibit seasonal shifts in habitat use. Since these seasonal movements can extend over distances of 20 km or more, a mechanism exists by which impacts on these species could extend beyond the proposed right-of-way boundaries.

It is also necessary to consider physical transport mechanisms that could affect ecological systems downwind or downstream of the proposed transmission line. For example, the introduction of sediments or contaminants into a watercourse could affect water quality and fish habitat suitability downstream of the proposed right-of-way.

The susceptibility of a species to impacts is also governed by the size and distribution of the species relative to the area of impact. Conover, et al. (1985) distinguished between three types of populations. Type 1 populations are considered most susceptible because they may have a large proportion of their population confined at any time within a given zone of influence. Type 2 populations include species which exist as a number of semi-isolated groups, or stocks, and have only a limited proportion of their population confined at any time to a given zone of influence. Therefore, although the entire species is not likely to be threatened by a particular source of impact, a particular group or stock could be vulnerable. By comparison, Type 3 populations have a widespread distribution and would have only a very small proportion of their population confined at any time to a particular zone of influence. The type of population is described for each Valued Ecosystem Component in Figure 3-1. A summary of the criteria used in the selection of Valued Ecosystem Components and the definition of ecological boundaries is provided in Figure 3-2, including the definition of the three types of population boundaries.

3.3.4 Socioeconomic Boundaries

Socioeconomic boundaries refer to the temporal and spatial scales for economic systems and socio-cultural aspects of the environment. Socioeconomic temporal boundaries can be established on the basis of a variety of temporal characteristics of the socioeconomic environment. Such factors include:

- the scale, time-frame, cyclical nature of, and trends in the functioning of the economic market system;
- the scale, time-frame and trends in the functioning of the political system;
- the time required for a response to a change in the socioeconomic environment to become evident;
- the time necessary for a response to a project-related impact to become evident; and
- the time required for the economy and the communities in which it functions to recover from a perturbation to its pre-impact state.

It is necessary, although difficult, to distinguish between changes in the socioeconomic environment which are project-related and those which are independent of the implementation

of the project. For example, outfitting will be affected by general recreational trends and the disposable income of clients, which in turn may be dependent on the economies of countries outside of Canada. It will therefore be necessary to predict possible impacts on outfitters in such a way as to isolate project impacts from external influences.
Socioeconomic boundaries can also be established on spatial characteristics of the socioeconomic environment. Such factors include:

- project-related social and economic impacts that are not confined to the boundaries of the project itself;
- the interdependence of the economic market system on local, regional, Provincial, national and international forces; and
- resource harvesting activities, some of which are specific to particular places, i.e., salmon rivers, and specific times, i.e., when the fishing season is open.

A summary of the criteria used in the selection of Valued Socioeconomic Components and the definition of socioeconomic boundaries is provided in Figure 3-4.

3.3.5 Technical Boundaries

Technical limitations on the ability to predict and monitor impacts must be taken into account at the outset of an EIA. These technical limitations define the technical boundaries of the EIA Study. Several important technical boundaries exist with respect to the proposed transmission line.

Quantitative information on the abundance and distribution of most wildlife species within the proposed right-of-way is lacking. As a consequence, impact predictions are made on the basis of evaluations of habitat suitability for important species within each area, harvest statistics and subjective status reports. It is impossible to identify the number of individuals of particular species that might be affected.

There is not a great deal of information on the effects of rights-of way on wildlife. Consequently, it is sometimes necessary to rely extensively on professional judgement to interpret the available data and make predictions.

Technical boundaries to the study of the socioeconomic impacts of the project arise from the lack of available baseline data for particular aspects of the socioeconomic environment. In some cases no data exist, in others, data are not available for the proposed transmission line itself, but rather for the village, parish, county, or Province level. Similarly, there are no data on the outfitting industry performance or on the game harvested. Also, the majority of recreational use of the proposed right-of-way is casual. The study team used professional judgement and relied on information gathered from user groups.

A further technical boundary exists in defining intangible activities and items, for instance, the quality of an outdoor experience and the pleasure people derive from conserving natural habitats. Pearce (1983) defined this concept as the existence value, the bequest value, and the option value people place on these intangible items. He argues that even people who will never use a given area, may either value it as an optional use, as something they would want to bequest to future generations, or something to which they give an intrinsic or existence value. The study team used the public consultation process and survey to obtain a subjective measure of this boundary.

An important technical boundary is the inability to meaningfully evaluate the potential impacts of the project at various points in the future. Since the degree of impact is predicated on the importance of the resources being affected, future changes in the value of the affected area for alternative land uses could influence the degree of conflict or interaction. For example, timber harvesting is recognized as a factor of overriding importance for many wildlife species. It has the potential to significantly alter the abundance and distribution of particular species; consequently, future timber harvesting activities within the study area could either increase or decrease the exposure of Valued Ecosystem Components to potentially harmful project activities. Since the future distribution and extent of timber harvesting and other land use influences within the study area are difficult to predict with reliability, despite 5-year and 25-year harvest plans, the impact predictions are based on environmental conditions as they currently exist. This is an assumption that might not be realistic over the life of the project.

CHAPTER FOUR

BIOPHYSICAL SETTING - PROPOSED ROUTE

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4.0 BIOPHYSICAL SETTING

This Chapter supplements Section B.1, Appendix B, in providing a more detailed description of the Valued Ecosystem Components as they occur within the Study Corridor. In particular, the distribution and habitats of the Components are discussed, where possible. For several Valued Ecosystem Components, little additional information to that presented in Appendix B is provided for the following reasons:

- the Route Selection Study (Appendix B) allowed for the avoidance of critical or important habitat; and
- there are, in many instances, no data on the specific biophysical resources for the proposed route.

4.1 Mammals

4.1.1 White-tailed Deer

As described in Section B.1.7, Appendix B, white-tailed deer are widely distributed across the Province and along the study corridor and proposed route in spring, summer and fall. In winter, however, deer congregate in Deer Wintering Areas (DWAs) for protection from adverse conditions such as low temperatures and deep snow (Huot, et al. 1984). The presence of these DWAs and factors influencing the distribution are described in relation to the proposed route, which was planned to avoid such areas where possible (Section B.1.7.1).

Deer may winter in more extensive areas as indicated by historical data, especially if the winter is relatively mild. Further, some traditional DWAs either no longer exist or are not being used every winter, as indicated in Section B.1.7.1. As well, some DWAs are dynamic so it is not always possible to avoid all areas during the Route Selection Study. Three DWAs crossed by the proposed route are discussed below and are shown in Figure 4-1; these were discovered during this EIA Study following completion of the Route Selection Study. Two are situated in the Salisbury to Newcastle portion of the proposed route, and one is in the Bathurst to Belledune portion.

A DWA containing about 200 deer and which is considered to be a prime wintering area is situated on freehold land west of the Monteagle Road and north of Highway 112 (the Fredericton Road) (T. Pettigrew, pers. comm.) (Figure 4-1) (Map 1). Although it is generally easy to bypass most DWAs, routing considerations dictated that the proposed route traverse this DWA for 3,585 m (Table H-1, Appendix H). The area lost to right-of-way construction totals 17.93 ha, only 1.57 percent of the total DWA. This is mostly a mixed use area, with some agriculture and woodlots and was used extensively by deer in the winter of 1989/90 (T. Pettigrew, pers. comm.).

The proposed route was planned to be situated west of a DWA bordering Highway 126 on the west and the Kouchibouguacis River on the north. The original location was identified by R. Currie (pers. comm.), and was avoided in the Route Selection Study. Current DNRE mapped data, which maps the DWA (#5837-1) as a discrete group of forest stands, shows that it is now situated further west (Figure 4-1) (Map 3). The proposed route now bisects the DWA for a distance of 1,290 m (Table H-1). The area lost to right-of-way construction totals 6.45 ha, only 1.43 percent of the total DWA.

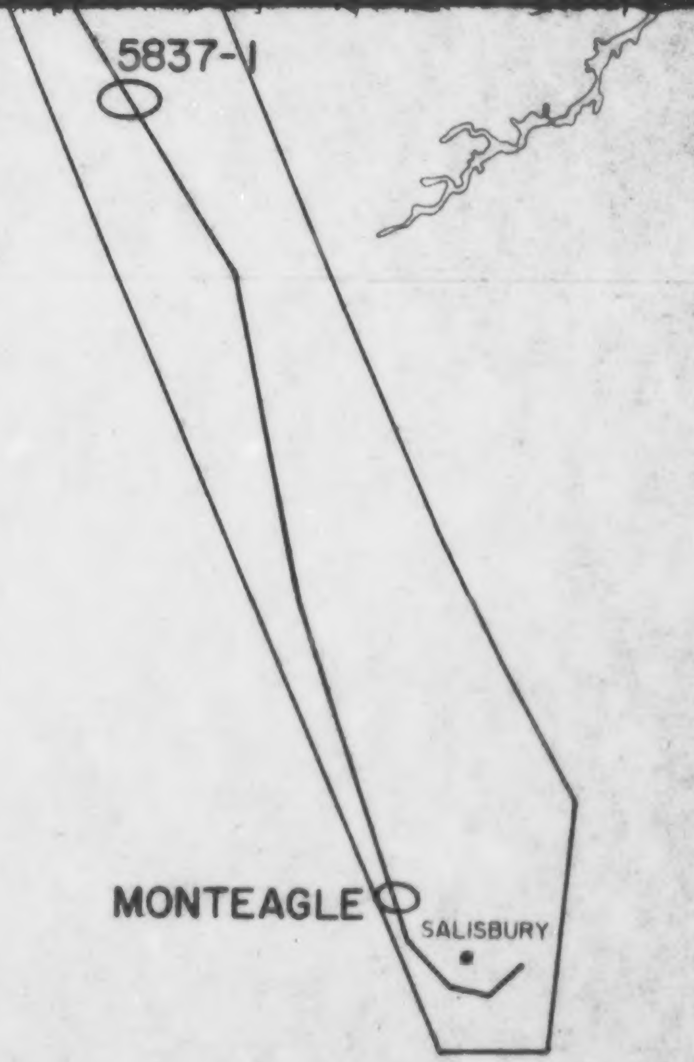
Similarly, a DWA which was originally recorded as being situated on the Restigouche/Gloucester County line, west of Boulay Pond and southwest of Belledune Lake, now extends further west. The proposed route now traverses the western portion of this DWA (# 5213-3) (Figure 4-1) for a distance of 770 m (Table H-1) (Map 8). The area lost for right-of-way construction totals 3.85 ha, only 2.56 percent of the DWA. Although formerly listed as a DWA, the area is now used mainly by moose (G. Godin, pers. comm.).

4.1.2 Moose

Moose wintering areas were not considered in the Route Selection Study since they do not form wintering concentrations to the same extent as deer (G. Godin, R. Currie, T. Pettigrew, pers. comm.). No specific data regarding moose in relation to the proposed route are available. The distribution of moose and moose habitat within the study corridor are discussed in Appendix B, Section B.1.7.2.

4.1.3 Marten

Marten inhabit mature to over-mature conifer or mixed-wood stands (Soutiere 1979; Steventon and Major 1972; D. Cartwright, pers. comm.) (Section B.1.7.3, Appendix B). Table 4-1 presents a summary of the percentage of mature and over-mature stands in Timber Licences 1 and 2 (28.2 percent) and 3 and 4 (22.3 percent) (Figure B-8, Appendix B) which are potential marten habitat; Licences 6 and 7 are excluded because the range of marten does not extend that far south. Twelve mature spruce-balsam fir and balsam fir-spruce stands comprise 10.2 percent of



DEER WINTERING AREAS
ALONG THE PROPOSED ROUTE
AIRES D'HIVERNAGE LE LONG
DU TRACÉ PROPOSÉ

wms associates ltd.
ENVIRONMENTAL CONSULTANTS AND PLANNERS
wms associés ltée
AMÉNAGISTES ET PROFESSIONNELS DE L'ENVIRONNEMENT

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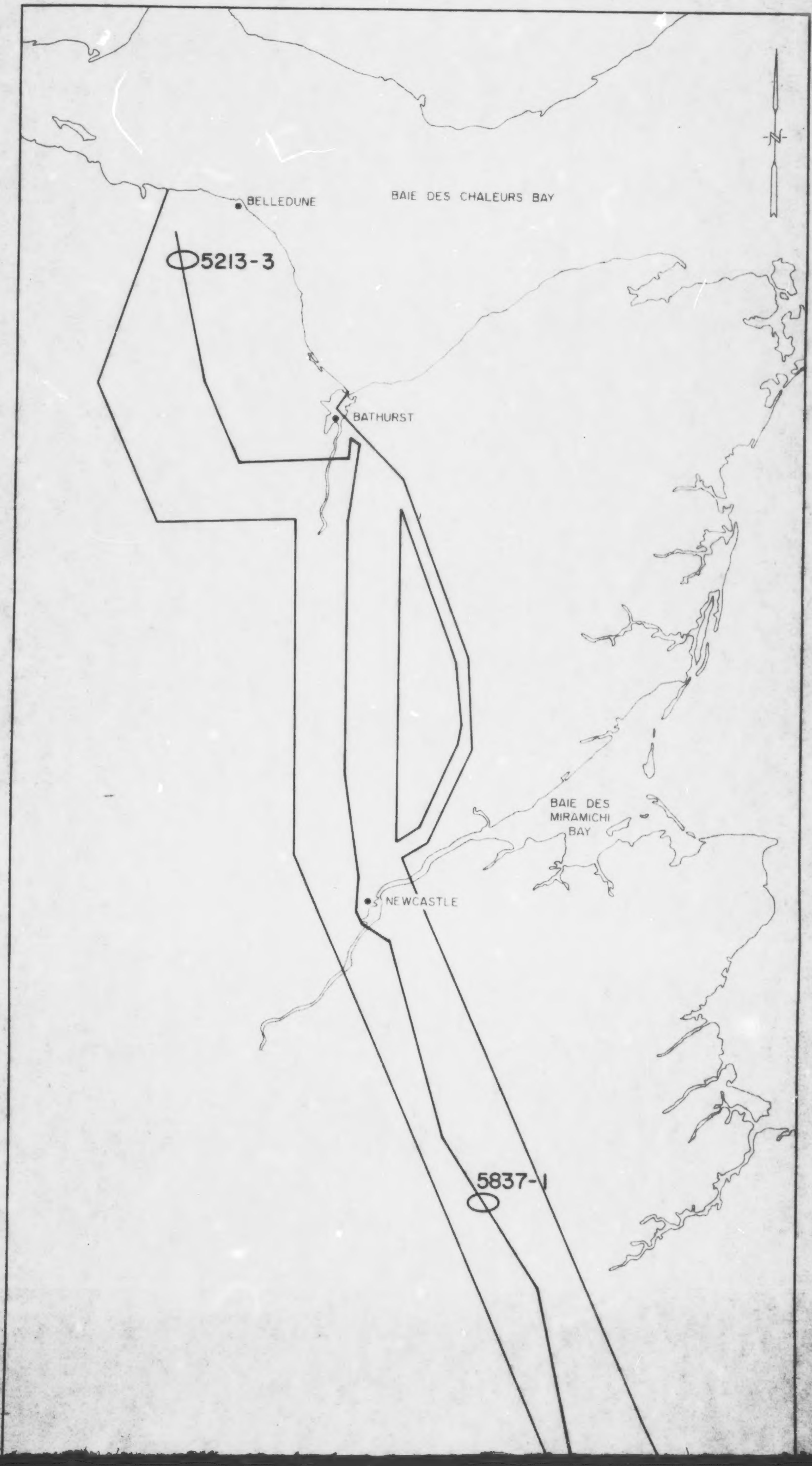N
BELLEDUNE
BAIE DES CHALEURS BAY
5213-3
BATHURST
BAIE DES
MIRAMICHI
BAY
NEWCASTLE
5837-1

TABLE 4-1: PERCENTAGE OF MATURE (M) AND OVERMATURE (O) STANDS SUITABLE FOR MARTEN HABITAT ALONG THE RIGHT-OF-WAY IN TIMBER LICENCES 1,2,3 AND 4

Forest Unit	Maturity	# of Stands	---- Right-of-way ---- Percent	Hectares
LICENCES 3 AND 4				
Softwoods				
BFSP	M	1	.96	3.77
SPBF	M	11	9.22	36.22
OTSW	M	3	2.43	9.55
OTSW	O	1	.96	3.77
Total		16	13.57	53.31
Hardwoods				
INHW	M	3	2.66	10.45
Total		3	2.66	10.45
Mixed				
BFTH	M	2	1.70	6.68
BFIH	O	1	.96	3.77
SPIH	M	1	.96	3.77
THSP	M	1	.96	3.77
IHBF	M	1	.74	2.91
IHSP	M	1	.74	2.91
Total		7	6.06	23.81
TOTAL		**26**	**22.29**	**87.57**
LICENCES 1 AND 2				
Softwoods				
BFSP	M	10	7.69	33.45
SPBF	M	6	2.56	11.14
OTSW	M	5	5.55	24.14
PINE	M	1	.43	1.87
Total		22	16.23	70.60
Hardwoods				
INHW	M	5	5.55	24.14
Total		5	5.55	24.14
Mixed				
BFTH	M	1	3.85	16.75
BFIH	M	1	.43	1.87
SPIH	M	2	.85	3.70
IHBF	M	1	.43	1.87
IHSP	M	2	.85	3.70
Total		7	6.41	27.89
TOTAL		**34**	**28.19**	**122.63**

NOTE:

Forest Unit

SP	Spruce (not identified to species)	PINE	Pine (not identified to species)
BF	Balsam Fir	INHW,IH	Intolerant Hardwood
OTSW	Other Softwood	TH	Tolerant Hardwood

SOURCE: C. Frame, DNRE (pers. comm.).

the right-of-way in Timber Licences 3 and 4; in Timber Licences 1 and 2, 21 balsam fir-spruce,
spruce-balsam fir and other softwood stands comprise 15.8 percent of the right-of-way (Table 4-1). The remaining mature stands in the Licences are mature or over-mature hardwoods and mixed stands. As well, the locations of individual marten populations are not well known within the Province, and certainly not in relation to the proposed route. Thus marten habitat appears to be distributed equally between Timber Licences 1, 2, 3 and 4.

4.2 Birds

4.2.1 Waterfowl

Productive waterfowl areas, where possible have been avoided along the proposed route due to the avoidance of wetlands in the Route Selection Study. However, one, a proposed Ducks Unlimited project near Harcourt, is situated within 50 m of the proposed route. DU intends to go ahead with the project, and has applied to NBDOE for a Watercourse Alteration Permit (A. McInnes, pers. comm.).

The distribution of waterfowl along the study corridor is as described in Section B.1.8.1 (Appendix B) and in Table B-3 which lists CWS waterfowl survey blocks in the study corridor region. Two of these survey blocks are located partly on the proposed route in the Salisbury to Newcastle portion; these are block 15 (Meadow Brook) and block 39 (Meadow Lake) (Figure B-6). One block (block 37 - Armstrong Lake) is situated near the proposed route in the Newcastle to Bathurst portion (Figure B-6). Meadow Brook (block 15) exhibited very low waterfowl densities of all species; Meadow Lake (block 39) and Armstrong Lake (block 37) exhibited moderate densities (Table B-3).

Wetlands with Golet scores (Section B.1.8.1) (Golet 1972) greater than 80 (Environment Canada 1987b) are crossed by the proposed route as follows:

Salisbury to Newcastle

- a narrow eastern extremity of unnamed wetland 322-85-10 (Environment Canada 1987b), 4 km southwest of Acadieville and north of the Kouchibouguac River (Map 3); and

- the Petitcodiac River (Map 1);

Newcastle to Bathurst

- wetland 259-16-114 (Green Brook) (Environment Canada 1987b), 3 km north of Beaver Brook Station at the existing transmission line (Map 5); and

Bathurst to Belledune

- wetland 91-9-9 (Environment Canada 1987b) (the Boulay Pond complex northwest of Big Meadow), crossed at five stream locations within the complex (Map 8).

4.2.2 Upland Game Birds

Upland game birds such as ruffed grouse are generally distributed along the study corridor and the proposed route, as described in Section B.1.8.2 (Appendix B). Specific data on their occurrence along the proposed route are not available.

4.2.3 Forest Avifauna

Forest avifauna are generally distributed along the proposed route, as described in Section B.1.8.3; specific data on their occurrence along the proposed route are not available.

4.3 Fish

Based on 1:50,000 scale mapping, there are a total of 90 watercourses which cross the proposed route; these are listed sequentially in Table 4-2.

Information on fish presence and habitat was limited to major streams and rivers where inventories had been completed (J. Gilbert, T. Pettigrew, B. Dubé, G. Godin, pers. comm.). Consideration was given only to that section of the watercourse crossed by the proposed route. Twenty-one watercourses which the proposed route crosses have been identified as having some significance for trout and/or salmon; they are listed generally from south to north within the study corridor, in relation to their particular drainage (Table 4-2).

Although 21 watercourses have been identified as being important for Valued Ecosystem Component species, it is presumed that all of the watercourses along the proposed route contain some fish, particularly Atlantic salmon and brook trout, and are thus fish habitat. Further,

TABLE 4-2: ANNOTATED SUMMARY OF WATERCOURSES AND FISH HABITAT CROSSED BY THE PROPOSED ROUTE

	Total Identified
Salisbury to Newcastle	38
Newcastle to Bathurst	14
Bathurst to Belledune	41
TOTAL WATERCOURSES	93

Salisbury to Newcastle: (see Maps 1 to 4)

Petitcodiac River Drainage:

- Petitcodiac River - important for salmon and trout populations; a known salmon spawning area is located upstream from Salisbury
- Bannister Brook
- Duncan Brook
- Little River
- North River - important trout habitat; a few juvenile salmon have been observed
- Montgomery Brook

Saint John River Drainage

- Canaan River - salmon and trout
- Middle North Branch Canaan River
- South Branch Canaan River
- Upper North Branch Canaan River (two tributaries)
- Nevers Brook
- Salmon River - salmon spawning habitat in headwaters
- one unnamed intermittent branch

Richibucto River Drainage

- North Forks Coal Branch River - good trout habitat, but no spawning areas for trout or salmon; a few juvenile salmon have been observed
- two unnamed intermittent tributaries
- Richibucto River - salmon and trout; an important sport fishing area
- Johnny Graham Fork (intermittent)
- Smith Meadow Brook (intermittent)

Kouchibouguacis River Drainage

- Kouchibouguacis River - primarily trout
- Lower Meadow Brook
- two unnamed intermittent tributaries

Kouchibouguac River Drainage

- Kouchibouguac River - trout
- Dales Brook

(Continued)

TABLE 4-2: ANNOTATED SUMMARY OF WATERCOURSES AND FISH HABITAT CROSSED BY THE PROPOSED ROUTE (CONTINUED)

Barnaby River Drainage

- Barnaby River - no salmon above Rogersville due to dam construction; lower end of river important for trout and salmon
- six unnamed intermittent tributaries
- Jam Brook
- Meadow Brook
- Middle Branch Barnaby River - trout
- one unnamed intermittent tributary

Miramichi River Drainage

- Northwest Miramichi River - mostly a corridor for salmon and trout; spawning areas are further upstream
- Southwest Miramichi River - mostly a corridor for salmon and trout; spawning areas are further upstream

Newcastle to Bathurst: (see Maps 4 to 7)

Bartibog River Drainage

- South Branch Bartibog River - important for searun trout and fall run of salmon; spawning area near Highway 8
- Middle Branch Bartibog River
- Campbell Brook - important for searun trout
- Green Brook - very important for searun trout
- Crazy Brook
- Mosquito Brook
- Beaver Brook
- High Bank Brook
- John Brook
- Oxford Brook

Nepisiguit River Drainage

- Cold Branch Brook
- Lawson Brook
- two unnamed tributaries

Bathurst to Belledune: (see Maps 7 and 8)

Nepisiguit River Drainage

- Boucher Brook
- Nepisiguit River - trout and salmon
- Little River
- four unnamed intermittent tributaries
- Middle River - good areas for salmon and trout spawning and nursery areas
- four unnamed intermittent tributaries
- Six Mile Brook
- Tetagouche River - mostly trout
- Patrick Brook

(Continued)

TABLE 4-2: ANNOTATED SUMMARY OF WATERCOURSES AND FISH HABITAT CROSSED BY THE PROPOSED ROUTE (CONTINUED)

Chaleur Bay Drainages

- North Branch Grants Brook
- South Branch Grants Brook
- four unnamed intermittent tributaries
- Millstream River - trout
- one unnamed intermittent tributary
- Rocky Brook
- Lavigne Brook
- one unnamed intermittent tributary
- Eel Brook - minor importance for trout
- Paynes Brook - trout only
- North Branch Nigadoo River - trout and juvenile salmon
- South Branch Nigadoo River - trout and salmon
- one intermittent tributary
- Nigadoo River - trout and salmon
- Ellis Brook
- Elmtree River
- three unnamed intermittent streams
- two unnamed tributaries
- Belledune River - minor importance for trout
- one unnamned tributary

SOURCE: 1:50,000 scale NTS maps; J. Gilbert, DNRE (pers. comm.)

even very small tributaries which are not identifiable on 1:50,000 scale mapping often provide important spawning and/or nursery habitat for salmonids. The Miramichi River is also important for striped bass, gaspereau and smelt. Details on these species in the study corridor are provided in Section B.1.9 (Appendix B).

4.4 Rare, Threatened and Endangered Species

4.4.1 Eastern Cougar

There is little known about the distribution and status of this species in New Brunswick (Section B.1.10.1, Appendix B). There does not appear to be a pattern to eastern cougar sightings in New Brunswick; the 300 unconfirmed reports since 1977 seem to be well distributed across the Province (G. Parker, pers. comm.; Parker 1983). One of the mapped sightings (#272) is located in the same area as the proposed route, at Pleasant Ridge west of Rogersville (B. Johnson, pers. comm.).

4.4.2 Lynx

Lynx are distributed throughout the forested areas of New Brunswick, and the population is considered to be low to rare in abundance (COSEWIC 1988) (Section B.1.10.2, Appendix B). Insufficient data exist to pinpoint the locations of lynx in relation to the proposed route.

4.4.3 Bald Eagle

The bald eagle population in New Brunswick (Section B.1.10.3, Appendix B) is very low, and to date, there has been only one nest located in the vicinity of the proposed route. This nest was situated at an undisclosed location on Beaubears Island in 1989 (R. Stocek, pers. comm.), between 1.7 to 3.8 km northeast of the proposed route (the length of the Island).

4.4.4 Osprey

Osprey are distributed throughout New Brunswick (Section B.1.10.4, Appendix B) but are concentrated along the coastal region near river mouths especially in the area north and south of the Miramichi River, and in the Bathurst Harbour area (Stocek and Pearce 1983). Of the 74 active osprey nests situated on NB Power transmission lines in 1989, none were located near the proposed route. Ospreys are less common inland, and tend to be present near bodies of water. Since the proposed route avoided most bodies of water, there will be very few if any osprey nests situated near the route.

4.5 Air Quality

Ozone is discussed in Section B.1.13.1 (Appendix B); specific data regarding ozone levels along the proposed route are not available.

4.6 Water Quality

Water quality data for 15 stations within the study corridor are discussed in Section B.1.14 (Appendix B).

The Middle River water supply watershed, which supplies the City of Bathurst, is crossed in two places by the proposed route (Fiander-Good 1989):

- the Middle River, 200 m northeast of a bridge on a road which parallels the River (2 km southeast of Rio Grande); and
- Six Mile Brook, 2.5 km west of Rio Grande.

Fiander-Good (1989) does not recommend restricting transmission line crossings of any of the watercourses within the Middle River watershed.

The Nigadoo River water supply watershed, which supplies Petit-Rocher, is also crossed by the proposed route in two places (WMS 1989):

- the South Branch and the North Branch of the Nigadoo River approximately 500 m west of their confluence with the Nigadoo River.

Transmission lines are recommended to be a permitted land use within the Nigadoo River watershed (WMS 1989).

CHAPTER FIVE
SOCIOECONOMIC SETTING FOR THE PROPOSED ROUTE

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5.0 SOCIOECONOMIC SETTING

This chapter presents the socioeconomic setting for the proposed route. Section B.2 (Appendix B), provides a more detailed description of the Valued Socioeconomic Components as they occur along the Study Corridor.

5.1 Land Use

5.1.1 Recreational Land Use

Recreational activities within the 50 m right-of-way as outlined by individuals surveyed (R. Pelletier; R. Savoie; I. Fowler; pers. comm.) include outdoor activities such as snowmobiling, cross-country skiing, hunting, fishing, camping, canoeing, hiking, and wildfood harvesting. These activities are fairly common for all areas.

For the most part, these activities very seldom use a transmission line right-of-way except to cross it. Some activities such as hunting and fishing may use the right-of-way as another trail or means of access to wilderness areas (G. Godin; S. Allen; pers. comm.). For wildberries, these newly cleared areas may provide new habitat for some of these edible plants. All terrain vehicles (ATVs) also use transmission lines (E. Bourque, pers. comm.).

Along watercourse crossings there would be some watersports activities present such as canoeing, sailing, waterskiing, and wind surfing along the Southwest and Northwest Miramichi Rivers. Smaller watercourse crossings would have canoeing and perhaps some kayaking.

5.1.1.1 Sport Fishing

Of the 90 watercourses flowing through the study corridor, the proposed route crosses 21 which have been identified as having some significance for trout and salmon. The following locations are noteworthy:

- a salmon pool in the Petitcodiac River, which is crossed over by the proposed route, is not currently angled, but a fisheries management restocking program could reinstate sea-run Atlantic salmon in the Petitcodiac River, making the salmon pool of local importance; this area is located upstream from Salisbury (A. Goddard, J. Gilbert; T. Pettigrew; pers. comm.);

- important trout habitat on the North River (J. Gilbert, pers. comm.);
- good trout habitat on the Coal Branch River and tributaries (South Forks and North Forks) (J. Gilbert, pers. comm.);
- good trout fishing on the Kouchiboucasis and Kouchibouguac Rivers (J. Gilbert, pers. comm.);
- an important salmon and trout fishing area on the Richibucto River (J. Gilbert, pers. comm.);
- important trout and salmon habitat and fishing at the lower end of the Barnaby River (J. Gilbert, pers. comm.);
- the Miramichi River, a corridor for salmon and trout to upstream areas in the Southwest and Northwest Miramichi Rivers (J. Gilbert, pers. comm.);
- the Campbell River, Green Brook and Bartibog River tributaries are an important fish habitat area (B. Dubé, pers. comm.), with Green Brook very important to sea-run trout;
- the headwaters of the Tabusintac and Eskedelloc Rivers which contain important salmon habitat (E. Legacé, pers. comm.); and
- good spawning and nursery areas on the Middle River, very important to Atlantic salmon stocks and supporting a significant sea-run trout fishery (as do the Nigadoo, Tetagouche, Millstream and Nepisiguit Rivers, the latter also supporting a significant salmon fishery) (A. Madden; J. Gilbert; pers. comm.).

The area within the proposed route is rich in trout habitat, so it can be assumed that almost any permanent stream can provide enough trout habitat to support some trout populations (J. Gilbert, pers. comm.). Brook trout are common in waters throughout the study area, and represent an important recreational resource throughout the Province (J. Gilbert, pers. comm.).

5.1.1.2 Hunting

The Salisbury to Newcastle section of the proposed route passes through the Canaan River Game Management Area, located in Wildlife Management Zone 18. The southern portion of the Salisbury to Newcastle section is more extensively hunted for deer than the remaining portions of the Salisbury to Newcastle section. Hunters in all sections of the Newcastle and Bathurst portion of the proposed route often use existing right-of-ways to access good hunting areas and to sight large game (R. Currie, pers. comm.).

The further north the proposed route progresses, the poorer the quality of hunting becomes. The Bathurst to Belledune portion of the proposed route travels through land considered to be poor hunting areas, as large game populations are low (especially white-tailed deer) (P. Tatlock, pers. comm.).

5.1.1.3 Snowmobiling

Snowmobiling activities by organised clubs are limited along existing transmission line right-of-ways. There is some use of these corridors for trails if they are in close proximity to existing communities and if they are crossed by other roads and trails. Special activities such as the Snow White Snowmobiling Event use transmission line rights-of-ways (C. Landry; G. Fournier; pers. comm.). In addition, several persons attending public information sessions noted that snowmobiling along transmission line right-of-ways is popular among local residents. The extent of the use is dependent upon its proximity to residential properties.

5.1.1.4 Cross-Country Skiing

Cross-country ski trails sometimes follow existing transmission line right-of-ways if they are located close to communities and are wooded, i.e., provide shelter from the wind and cold. Open areas do not provide adequate shelter against wind and cold, therefore decreasing the enjoyment of the outing (R. Vienneau; V. Goodfellow; pers. comm.). Special events such as the Newcastle Loppet also use existing transmission line right-of-ways (V. Goodfellow, pers. comm.).

5.1.1.5 Canoeing

The transmission line right-of-way crosses several rivers used for canoeing. B.2.2.1 provides details on canoeable rivers.

5.1.1.6 Camping

Campgrounds, Provincial Parks, Rest Areas

With the exception of The Enclosure Provincial Park, no private campgrounds, Provincial Parks or Rest Areas exist within one kilometre of the proposed route. The proposed route follows an existing transmission line corridor into the Newcastle terminal, which runs west of The Enclosure Provincial Park.

Crown Land Campsite Leases

With the exception of Crown Land campsite lease #1055, no Crown Land campsite lease exists within one kilometre of the proposed route. Lease #1055, owned by Eloi Boucher, is located on Red Pine Brook west of the Canadian National Railway line, and is situated 0.2 km west of the proposed route.

5.1.2 Commercial Land Use

5.1.2.1 Forestry Operations

Silvicultural Operations

Generally, the proposed route avoids silvicultural operations, and crosses them only when necessary; extensive areas of silvicultural operations are avoided.

Between Salisbury and Newcastle, the proposed route passes generally between two areas of silvicultural operations north of Monteagle, crossing only small portions of their extremities. The proposed route avoids three sites west of Coal Branch and several sites west of Salmon River. There are few sites located between Harcourt and Newcastle.

There are extensive silvicultural operations north of Newcastle. The proposed route passes to the west of forestry operations north of Green Brook but east of the CNR/transmission line corridor. Sites two kilometres north of and four kilometres south of Bartibog Station are traversed.

Between Bathurst and Belledune the only operations are located in the Sormany to Nicholas-Denys area; these are avoided by the proposed route.

Permanent Sample Plots

A total of 24 PSPs are located within 1.5 kilometres of the proposed route; two (7038 and 2159) are crossed by the proposed route.

Estimation of Lost Wood Volume

This section describes the actual frequency distribution of stands along the proposed route in terms of Forest Licences, and assigns a volume of merchantable timber lost along the right-of-way. The procedure followed to arrive at these estimates was as follows:

- stands along the proposed route were sampled every five centimetres on Forest Development Survey Maps with a scale of 1:12,500 (or an estimated 625 m) and the stand number was recorded;
- lumped frequency distribution summaries for each Forest Licence were determined by providing a list of the sampled stand numbers to Timber Management Branch of DNRE;
- Timber Management Branch then provided a list of the cover types and associated development stages, the number of samples, and the percent of each cover type occurring within the Licence (C. Frame, pers. comm.);
- as the sample sizes for some Licences were too small, the six Licences (Figure B-8) were grouped into three, as follows:
    - 6 and 7 (Queens-Charlotte and Fundy), covering the area between Salisbury and Noinville;
    - 3 and 4 (Lower and Upper Miramichi), covering the area between Noinville and Bartibog Station (approximating the Miramichi River drainage); and
    - 1 and 2 (Upsalquitch and Nepisiguit), covering the area between Bartibog Station and the proposed Belledune Terminal;

- the length within each Forest Licence was determined by multiplying the length of the proposed route as measured (on Forest Development Survey maps) by 50 m to determine an area in hectares; figures for each forest unit were determined by multiplying the percentage (C. Frame, pers. comm.) by the total area of the grouped Licences;

- the total hectares for each Licence grouping were then multiplied by estimated figures for each forest type (C. Frame, pers. comm.) to determine the gross merchantable volume per hectare (m^3/ha) removed by the cutting of the right-of-way (Tables 5-1, 5-2 and 5-3);

- finally, the volume figures were grouped into softwood and hardwood components (mixed hardwood and softwood stands were factored at 70 percent for the dominant group and 30 percent for the remainder), and current royalties, updated to 1990 based on fair market value under the **Crown Lands and Forests Act (New Brunswick Regulation 89-42)**, were applied, as follows (J. Scott, pers. comm.):

    - softwood - sawlogs, \$10.60/m^3;

    - softwood - pulpwood, \$9.40/m^3;

    - hardwood - sawlogs, \$10.60/m^3; and

    - hardwood - pulpwood, \$5.55/m^3.

Tables 5-1 to 5-3 show the estimated total volumes of merchantable timber along the proposed right-of-way that will be lost when the right-of-way is cleared.

Licences No. 6 and 7 (Table 5-1) will lose an estimated 23,871 m^3 of softwoods, 3,652 m^3 of hardwoods, 3,695 m^3 of mixed woods which are softwood dominant and 4,063 m^3 of mixed woods which are hardwood dominant, for a total estimated wood volume loss of 35,281 m^3.

Licences No. 3 and 4 (Table 5-2) will lose an estimated 16,789 m^3 of softwoods, 5,481 m^3 of hardwoods, 4,545 m^3 of mixed woods which are softwood dominant and 5,282 m^3 of mixed woods which are hardwood dominant, for a total estimated wood volume loss of 32,097 m^3.

TABLE 5-1: LUMPED FREQUENCY DISTRIBUTION SUMMARY, CROWN TIMBER LICENCES NO. 6 AND 7

Forest Unit Maturity		# of Stands	%	Forest Cover (ha)	Area (ha)	Standing Volume Forest Unit (m³/ha)	Standing Volume Total (m³)
Softwoods							
BFSP	R	1	.74	418.1	3.09		
BFSP	I	1	.91	418.1	3.80	115	437.54
SPBF	R	10	9.1	418.1	38.05		
SPBF	Y	3	2.24	418.1	9.37	89	833.52
SPBF	I	19	14.99	418.1	62.67	104	6518.01
SPBF	M	26	21.36	418.1	89.31	135	12056.33
OTSW	M	2	1.82	418.1	7.61	142	1080.54
PINE	R	1	.91	418.1	3.80		
PINE	I	3	2.24	418.1	9.37	133	1245.60
PINE	M	2	1.65	418.1	6.90	146	1007.20
PSSP	M	3	2.4	418.1	10.03	69	692.37
Total		71	58.36		244.00		23871.13
Hardwoods							
TOHW	M	1	.91	418.1	3.80	119	452.76
THIH	I	1	.91	418.1	3.80	79	300.57
INHW	R	1	.74	418.1	3.09		
INHW	I	3	3.49	418.1	14.59	101	1473.76
INHW	M	2	1.49	418.1	6.23	123	766.25
INHW	O	1	.91	418.1	3.80	152	578.32
IHTH	M	1	.74	418.1	3.09	26	80.44
Total		10	9.19		38.42		3652.10
Mixed - Softwood Dominant							
BFIH	Y	1	.74	418.1	3.09	56	173.26
BFIH	I	1	.74	418.1	3.09	101	312.49
BFIH	M	2	1.49	418.1	6.23	137	853.47
SPIH	I	3	2.24	418.1	9.37	120	1123.85
SPIH	M	2	1.49	418.1	6.23	114	710.18
SPTH	M	1	.91	418.1	3.80	137	521.25
Total		10	7.61		31.82		3694.50
Mixed - Hardwood Dominant							
THSP	I	2	1.49	418.1	6.23	118	735.10
THSP	M	1	.91	418.1	3.80	146	555.49
IHSP	I	2	1.65	418.1	6.90	118	814.04
IHSP	M	3	2.24	418.1	9.37	125	1170.68
IHBF	I	1	.91	418.1	3.80	90	342.42
IHBF	M	1	.75	418.1	3.14	142	445.28
Total		10	7.95		33.24		4063.01

(continued)

TABLE 5-1: LUMPED FREQUENCY DISTRIBUTION SUMMARY, CROWN TIMBER LICENCES NO. 6 AND 7 (CONTINUED)

Forest Unit	Maturity	# of Stands	%	Forest Cover (ha)	Area (ha)	Standing Volume Forest Unit (m^3/ha)	Standing Volume Total (m^3)
Cuts							
CC	C	2	1.82	418.1	7.61		
CC(1987)	C	1	.91	418.1	3.80		
SWC	C	1	.74	418.1	3.09		
Total		4	3.47		14.51		.00
Non-productive Areas							
AG		5	4.54	418.1	18.98		
F	F	1	.91	418.1	3.80		
AW		4	3.31	418.1	13.84		
NP		2	1.65	418.1	6.90		
WL		5	3.89	418.1	16.26		
Total		17	14.3		59.79		.00
TOTAL		**122**	**100.88**		**421.78**		**35,280.74**

Note: Forest Units

BF	Balsam Fir
SP	Spruce (not identified to species)
OTSW	Other Softwood
PINE	Pine (not identified to species)
PSSP	Poor Site Spruce
TOHW and TH	Tolerant Hardwood
INHW and IH	Intolerant Hardwood
CC	Clearcut
SWC	Softwood Cut
HWC	Hardwood Cut
AG	Agriculture Area
F	Field
AW	Wetland With Alders
NP	Non-Productive Area
WL	Wetland
BB	Burned Area

Dominance: First group listed in forest unit is dominant, eg. BFSP = Balsam Fir (dominant) - Spruce (Secondary)

Maturity

R	Regenerating
Y	Young
I	Immature
M	Mature
O	Overmature

Source: C. Frame (pers. comm.)

TABLE 5-2: LUMPED FREQUENCY DISTRIBUTION SUMMARY, CROWN TIMBER LICENCES NO. 3 AND 4

Forest Unit	**Maturity**	**# of Stands**	**%**	**Forest Cover (ha)**	**Area (ha)**	**Standing Volume**	
						Forest Unit (m³/ha)	**Total (ha)**
Softwoods							
BFSP	I	4	3.17	392.85	12.45	115	1432.13
BFSP	M	1	.96	392.85	3.77	152	573.25
SPBF	R	1	.73	392.85	2.87		
SPBF	Y	5	4.13	392.85	16.22	89	1444.00
SPBF	I	14	11.65	392.85	45.77	104	4759.77
SPBF	M	11	9.22	392.85	36.22	135	4889.80
OTSW	Y	2	1.47	392.85	5.77	81	467.77
OTSW	M	3	2.43	392.85	9.55	142	1355.57
OTSW	O	1	.96	392.85	3.77	170	641.13
PINE	R	1	.74	392.85	2.91		
PINE	Y	1	.74	392.85	2.91	102	296.52
PINE	I	1	.74	392.85	2.91	133	386.64
PSSP	I	2	1.47	392.85	5.77	94	542.84
Total		47	38.41		150.89		16789.43
Hardwoods							
INHW	R	2	1.7	392.85	6.68		
INHW	Y	6	5.32	392.85	20.90	31	647.89
INHW	I	10	8.94	392.85	35.12	101	3547.20
INHW	M	3	2.66	392.85	10.45	123	1285.33
IHTH	R	1	.96	392.85	3.77		
Total		22	19.58		76.92		5480.41
Mixed - Softwood Dominant							
BFTH	M	2	1.7	392.85	6.68	151	1008.45
SPTH	I	3	2.66	392.85	10.45	130	1358.48
BFIH	I	2	1.7	392.85	6.68	101	674.52
BFIH	O	1	.96	392.85	3.77	101	380.91
SPIH	I	2	1.47	392.85	5.77	120	692.99
SPIH	M	1	.96	392.85	3.77	114	429.94
Total		11	9.45		37.12		4545.27
Mixed - Hardwood Dominant							
THBF	I	1	.74	392.85	2.91	79	229.66
THSP	M	1	.96	392.85	3.77	146	550.62
IHBF	R	1	.74	392.85	2.91		
IHBF	Y	2	1.47	392.85	5.77	88	508.19
IHBF	I	3	2.21	392.85	8.68	90	781.38
IHBF	M	1	.74	392.85	2.91	142	412.81
IHSP	Y	1	.74	392.85	2.91	63	183.15
IHSP	I	6	4.86	392.85	19.09	118	2252.92
IHSP	M	1	.74	392.85	2.91	125	363.39
Total		17	13.2		51.86		5282.10

(Continued)

TABLE 5-2: LUMPED FREQUENCY DISTRIBUTION SUMMARY, CROWN TIMBER LICENCES NO. 3 AND 4 (CONTINUED)

Forest Unit	**Maturity**	**# of Stands**	**%**	**Forest Cover (ha)**	**Area (ha)**	**Standing Volume Forest Unit (m³/ha)**	**Standing Volume Total (ha)**
Cuts							
CC	C	2	1.7	392.85	6.68		
HWC	C	3	2.43	392.85	9.55		
SWC	C	4	3.62	392.85	14.22		
Total		9	7.75		30.45		.00
Non-productive Areas							
AG		3	2.21	392.85	8.68		
F	F	2	1.7	392.85	6.68		
AW		3	2.43	392.85	9.55		
NP		2	1.92	392.85	7.54		
WL		3	2.43	392.85	9.55		
BB	B	1	.96	392.85	3.77		
Total		14	11.65		45.77		.00
TOTALS		**120**	**100.04**		**393.01**		**32,097.22**

Note: Forest Units

BF	Balsam Fir
SP	Spruce (not identified to species)
OTSW	Other Softwood
PINE	Pine (not identified to species)
PSSP	Poor Site Spruce
TOHW and TH	Tolerant Hardwood
INHW and IH	Intolerant Hardwood
CC	Clearcut
SWC	Softwood Cut
HWC	Hardwood Cut
AG	Agriculture Area
F	Field
AW	Wetland With Alders
NP	Non-Productive Area
WL	Wetland
BB	Burned Area

Dominance: First group listed in forest unit is dominant, eg. BFSP = Balsam Fir (dominant) - Spruce (Secondary)

Maturity

R	Regenerating
Y	Young
I	Immature
M	Mature
O	Overmature

Source: C. Frame (pers. comm.)

TABLE 5-3: LUMPED FREQUENCY DISTRIBUTION SUMMARY, CROWN TIMBER LICENCES NO. 1 AND 2

Forest Unit	**Maturity**	**# of Stands**	**%**	**Forest Cover (ha)**	**Area (ha)**	**Standing Volume**	
						Forest Unit (m³/ha)	**TOTAL (ha)**
Softwoods							
BFSP	Y	1	.43	435	1.87	38	71.08
BFSP	I	3	4.7	435	20.45	115	2351.18
BFSP	M	10	7.69	435	33.45	152	5084.63
SPBF	I	13	12.39	435	53.90	104	5605.24
SPBF	M	6	2.56	435	11.14	135	1503.36
OTSW	I	2	.85	435	3.70	117	432.61
OTSW	M	5	5.55	435	24.14	142	3428.24
PINE	R	1	.43	435	1.87		
PINE	I	3	1.28	435	5.57	133	740.54
PINE	M	1	.43	435	1.87	146	273.09
Total		45	36.31		157.95		19,489.96
Hardwoods							
TOHW	Y	11	11.54	435	50.20	51	2560.15
TOHW	I	1	.43	435	1.87	118	220.72
THIH	R	1	3.85	435	16.75		
THIH	Y	4	5.13	435	22.32	41	914.94
THIH	I	2	7.69	435	33.45	79	2642.67
INHW	Y	3	1.28	435	5.57	31	172.61
INHW	I	15	6.41	435	27.88	101	2816.23
INHW	M	5	5.55	435	24.14	123	2969.53
IHTH	Y	1	.43	435	1.87	22	41.15
IHTH	I	1	.43	435	1.87	80	149.64
Total		44	42.74		185.92		12,487.63
Mixed - Softwood Dominant							
BFTH	I	1	.43	435	1.87	104	194.53
BFTH	M	1	3.85	435	16.75	151	2528.87
SPTH	I	2	.85	435	3.70	130	480.68
BFIH	I	2	.85	435	3.70	101	373.45
BFIH	M	1	.43	435	1.87	137	256.26
SPIH	I	2	.85	435	3.70	120	443.70
SPIH	M	2	.85	435	3.70	114	421.52
Total		11	8.11		35.28		4699.00
Mixed - Hardwood Dominant							
THBF	Y	1	.43	435	1.87	42	78.56
THSP	R	2	.85	435	3.70		
THSP	I	1	.43	435	1.87	118	220.72
IHBF	Y	1	.43	435	1.87	88	164.60
IHBF	I	2	.85	435	3.70	90	332.78
IHBF	M	1	.43	435	1.87	142	265.61
IHSP	Y	1	.43	435	1.87	63	117.84
IHSP	I	3	1.28	435	5.57	118	657.02
IHSP	M	2	.85	435	3.70	125	462.19
Total		14	5.98		26.01		2299.32

(Continued)

TABLE 5-3: LUMPED FREQUENCY DISTRIBUTION SUMMARY, CROWN TIMBER LICENSES NO. 1 AND 2 (CONTINUED)

Forest Unit	**Maturity**	**# of Stands**	**%**	**Forest Cover (ha)**	**Area (ha)**	**Standing Volume Forest Unit (m³/ha)**	**Standing Volume TOTAL (ha)**
Cuts							
CC	C	2	.85	435	3.70		
CC(1903	C	2	.85	435	3.70		
Total		4	1.7		7.40		.00
Non-productive Areas							
AG		1	.43	435	1.87		
F	F	2	.85	435	3.70		
AW		6	2.56	435	11.14		
NP		2	.85	435	3.70		
WL		1	.43	435	1.87		
Total		12	5.12		22.27		.00
TOTALS		**130**	**99.96**		**434.83**		**38,975.91**

Note: Forest Units

BF	Balsam Fir
SP	Spruce (not identified to species)
OTSW	Other Softwood
PINE	Pine (not identified to species)
PSSP	Poor Site Spruce
TOHW and TH	Tolerant Hardwood
INHW and IH	Intolerant Hardwood
CC	Clearcut
SWC	Softwood Cut
HWC	Hardwood Cut
AG	Agriculture Area
F	Field
AW	Wetland With Alders
NP	Non-Productive Area
WL	Wetland
BB	Burned Area

Dominance: First group listed in forest unit is dominant, eg. BFSP = Balsam Fir (dominant) - Spruce (Secondary)

Maturity

R	Regenerating
Y	Young
I	Immature
M	Mature
O	Overmature

Source: C. Frame (pers. comm.)

Licences No. 1 and 2 (Table 5-3) will lose an estimated 19,490 m^3 of softwoods, 12,488 m^3 of hardwoods, 4,699 m^3 of mixed woods which are softwood dominant, and 2,299 m^3 of mixed woods which are hardwood dominant, for a total estimated wood volume loss of 38,976 m^3.

5.1.2.2 Agriculture

Few agricultural areas are located along the proposed route, and these are mostly in the extensive areas of private land in the Salisbury area, along Route 126, the Newcastle area, and the areas south and west of Bathurst. Fields are generally small in extent, and are bordered by forest.

Route 6 southwest of Salisbury has some agricultural activity, but sites are crossed only where necessary. Small agricultural areas along Monteagle Road and its associated side roads are avoided. The proposed route is located west of any agricultural operations associated with Route 126. Roads in the Rogersville area which provide access to Sapin Court, Pleasant Ridge, Young Ridge and West Collette pass minor farming operations, but these small operations are generally avoided.

However, in the Rogersville area, brussel sprout crops are within the study corridor. Presently these crops are under utilized, but a local agricultural cooperative is making efforts to increase the production of brussel sprouts and other diversified crops. Some of this land area lies within the proposed route (W. Ferguson, pers. comm.).

There are no agricultural operations, including blueberry production, located along the proposed route between Newcastle and Bathurst. However, there are some small family operations located along the roads west of Bathurst (South Tetagouche, Sormany and Nicolas-Denys). North of these locations, there are few, if any, agricultural sites.

5.1.2.3 Trapping

As stated in Section B.2.2.2, most of the trapping activity in the three Forest Administration Regions occurs outside of the study corridor. As the proposed route is located within the study corridor, and the right-of-way is only 50 m in width, it can be expected that an even smaller percentage of trapping occurs along the proposed route.

As noted in Section B.2.2.2, the northern portion of the Province and the study corridor (and therefore the proposed route), is more heavily harvested for furbearers than is the southern portion of the route. However, furbearer harvest statistics are available only at the County level, therefore pinpointing specific areas of harvesting activity is not possible. The only area close to the proposed route, which was specifically cited by DNRE personnel as being popular for trapping activity, is located in the area of Red Pines. The proposed route crosses this area.

5.1.2.4 Mining and Mineral Resources

Bedrock Quarries

Between Salisbury and Newcastle, the proposed route passes 200 m west of a quarry site which is located north of the CNR tracks and east of North Branch.

Between Newcastle and Bathurst, the proposed route passes 200 m west of a quarry site situated three kilometres north of Bartibog Station.

Between Bathurst and Belledune, there is an extensive region of mining claims situated north of Val Michaud. The proposed route, through necessity, passes through many of these claims, but avoids all active mine sites. There is a quarry site located south of the junction of the proposed route and the existing transmission line right-of-way. The proposed route does not come near the boundaries of this site (NB Power, pers. comm.).

Granular Aggregates

N.T.S. Index Maps of Granular Aggregate Resources indicate that granular aggregate deposits are located in several places along the proposed route, but there are few active sites.

Between Salisbury and Newcastle, the proposed route passes through an undeveloped deposit situated along the Petitcodiac River southwest of Salisbury which is not being worked and has a minimal potential at best (P. O'Leary, pers. comm.). There are few areas between Salisbury and Rogersville; however, the route crosses a small undeveloped deposit west of Young Ridge which is an old, expired sand and gravel lease (P. O'Leary, pers. comm.). There are no other such deposits in this section of the proposed route.

In the Newcastle to Bathurst section, the proposed route crosses one small deposit. This deposit, located 3.5 km north of Busby, straddles the proposed route. This site is of no concern or potential (P. O'Leary, pers. comm.).

Between Bathurst and Belledune, an extensive deposit of granular aggregates is situated along the Nepisiguit River south of Bathurst. Several sites are being extensively mined, including two sites south of Gloucester Junction through which the proposed route passes. The proposed route crosses undeveloped deposits located two kilometres southwest of Rio Grande, between Nigadoo Lake and Nicholas-Denys, and south of the junction of the route and the existing transmission line south of the proposed terminal.

Peat Extraction

Between Salisbury and Newcastle, the proposed route passes over the eastern edge of Bog 39, 700 m west of Bog 40, and four kilometres west of Bog 41, the latter being the Birch Ridge Bog which contains a commercial lease operation. The proposed route proceeds in a westerly direction at Acadie Siding, crossing the narrow portion and avoiding the wide portion of Bog 16 situated west of the community.

As noted in Section B.2.2.2, Bogs 39, 40 and 16 have development potential but have not yet been developed, although Bog 40 will be subject to a peat lease in the near future (B. Evered, pers. comm.). There are no other bogs of commercial potential which are situated near the proposed route.

5.1.2.5 Maple Sugar

The proposed route between the two Salisbury to Bathurst segments is not located on or close to any maple sugar operations. From Bathurst to Belledune, the proposed route passes 200 m west of a maple sugar operation located 500 m south of the Sormany Road and three kilometres west of Sormany. All other maple sugar operations in this section of the proposed route are avoided.

5.1.2.6 Airports

The proposed route avoids the Rogersville air strip and its 1,200 m (from the west end of the runway) exclusion zone by 1.5 km.

The proposed route passes through a height restricted zone for the Canadian Forces Base Chatham airport which extends to seven nautical miles (13 km) from the end of the active runway, as far as Lower Derby. The exclusion zone extends as far west as Lower Derby and McKay Cove.

The 4,000 m exclusion zone around Bathurst airport is avoided by 2 km.

5.1.2.7 Outfitting

There are approximately six outfitters located within, or close to, the study corridor. However, only two outfitters, the Salmon River Lodge and the Broken Feather Lodge, located in the Salisbury to Newcastle region, actually operate within the boundaries of the proposed route.

Specifically the route passes through the Salmon River along Route 116 near Harcourt. This area is used from May through December by the Salmon River Lodge for hunting deer and woodcock and fishing salmon and trout (J. Mills; pers. comm.).

The route passes through the Northwest Miramichi River which is used occasionally by the Broken Feather Lodge. The area is used from May through November for hunting deer, bear, partridge and ducks, and fishing salmon and trout. The owner of the lodge currently uses the transmission line right-of-ways and feels he will be able to make use of the proposed right-of-way (W. Ward; pers. comm.).

5.1.2.8 Fox Farms

There are six fox farms located in the vicinity of the proposed transmission line right-of-way in the Salisbury area. These are mostly located within the Salisbury Back, Grub, and Mollins Roads areas. Of these, two are more than one kilometre from the proposed route; one is less than one kilometre from the proposed route (located on the Salisbury Back Road); two are approximately 500 m away (located on the Mollins Road); and one is approximately 100 m east (located on the Grub Road) of the proposed route (D. Balzer; C. Goguen; P. Cyr; B. Price; R. Carson; B. Williams; R. Steeves; C. Young; L. Lynn; pers. comm.).

5.2 Communities

5.2.1 Private and Crown Land

As the proposed route passes west and north from Salisbury to Newcastle, it traverses an extensive area of private land. The proposed route enters Crown land at the north end of the Monteagle Road. North of the Canaan River the Crown land is part of the Canaan River Game Management Area, which is treated as Crown land (J. Patch, pers. comm.). The proposed route then crosses an extensive area of Crown land between Hebert to Adamsville. The proposed route has been selected to pass through Crown land between small parcels of private land east of Coal Branch Lake. The proposed route then passes through private land east of St-Sosime and west of Grangeville. Continuing north, the proposed route traverses Crown land except for a small parcel 1.5 km west of Mortimer. Along Route 126 the proposed route is drawn to traverse Crown land west of the private grants, especially at Mortimer, Kent Junction, Noinville and Acadie Siding. The proposed route enters a large block of private land between Rogersville and West Collette, then Crown land between West Collette and Semiwagan Ridge. North of this point, up to and including Newcastle and area, the land is all private, except for small blocks northwest of Barnaby River.

The proposed route passes through mainly private land north of Newcastle except for a block of Crown land southwest of Patterson Siding and minor parcels between Beaver Brook Station and Busby. North of Busby, the land is all Crown, except for small parcels at Bartibog Station and Route 360, north to Chamberlain Settlement. Past this location and north to Bathurst terminal, the land is all private.

The proposed route traverses private land south from the Bathurst terminal to Blue Mountain Settlement then passes through Crown land as far as the road southeast of Rio Grande, then Crown land as far as a large block of private land at South Tetagouche. The proposed route also passes through an extensive block of private land west of Sormany, Nicholas-Denys and Free Grant. Between Free Grant and east of Mitchell Settlement the land is Crown. There is a patchwork of Crown and private land as far north as the proposed Belledune terminal.

More detail, with respect to residential land areas located within or relatively close to the proposed route, is provided in Sections 5.1.3.2, 5.1.3.3 and 5.1.3.4 which follow.

5.2.2 Salisbury to Newcastle

At the southern end of the Salisbury to Newcastle proposed route is a grouping of several residential areas in the Salisbury to Monteagle area. The proposed route passes through the high density subdivision of Five Points at the Mollins Road, through a cluster of houses on the Salisbury Back Road, and crosses Route 106 through another high density ribbon development. It passes 300 m west of a high density ribbon development on Rout 2.

West of Monteagle the proposed route crosses the B. Eagles Road 200 m west of a high density ribbon development. West of Grangeville on the Grangeville Road it passes 300 m west of a high density ribbon development. The proposed route then passes 100 m west of a high density ribbon development on the St-Therese Road. The high density ribbon development of Pleasant Ridge is passed through at the Pleasant Ridge Road. The route then passes 400 m east of West

Collette at the West Collette Road. The proposed route passes through the east end of a high density ribbon development west of the Barnaby River at the South Barnaby River Road and the North Barnaby River Road. It crosses high density ribbon developments on Highway 118 at Nelson Junction, Route 8 at Derby Junction, and Route 425 at Jones Crossing as it parallels the existing transmission line. The proposed route also crosses the proposed Newcastle-Douglastown By-pass in the vicinity of Route 430 and the Newcastle Terminal Station (M. Phillips, pers. comm.).

North of Newcastle the proposed route enters and exits the Newcastle terminal through high density ribbon development northwest of Cross Roads at Route 430.

All other communities within the Salisbury to Newcastle region have been avoided by more than 500 m by the proposed route.

Land use in the proposed route is primarily woodland, with less frequent uses including:

- residential;
- agricultural;
- industrial;
- roadway; and
- cleared woodland.

5.2.3 Newcastle to Bathurst

Between Newcastle and Bathurst, the proposed route passes through few residential areas. North of Newcastle it passes through a small area at Bartibog Station. From Poirier Subdivision the proposed route passes 200 m from the back of properties along Route 8 (Miramichi Avenue) to St. Mary.

All other communities within the Newcastle to Bathurst region have been avoided by more than 500 m.

Land use status in the Newcastle to Bathurst portion of the proposed route is primarily woodland, with less frequent uses including:

- residential;
- industrial; and
- roadway.

5.2.4 Bathurst to Belledune

The proposed route crosses several residential roads in the vicinity of Bathurst. It passes 300 m east of houses on the Chamberlain Road and 450 m east of houses on the Chamberlain Settlement Road. The high density ribbon development at Blue Mountain Settlement is avoided as the route crosses the Big River Road 250 m north of houses. On Route 430 the route passes a high density ribbon development 150 m north and 300 m south of houses.

In the Rio Grande area the proposed route passes 60 m south of residences on the Thériault Road. It then crosses the Sormany Road 150 m west of a house and 200 m east of a house on the South Tetagouche Road. In Nicholas-Denys the proposed route passes through a high density ribbon development.

All other communities within the Bathurst to Belledune region have been avoided by more than 500 m by the proposed route.

Land use status within the proposed Bathurst to Belledune Route is primarily woodland, with less frequent uses including:

- woodland and agriculture;
- woodland and residential;
- gravel pits;
- rail lines;
- residential; and
- roadway and highway.

5.3 Land Status

5.3.1 Land Value Within Selected Route

NB Power determines land values within the selected route based upon the level of property development. If the property is developed land, such as a cleared lot or containing a structure, then NB Power retains an independent appraiser to determine the value of the land. For undeveloped property, NB Power relies on local assessment records to ascertain the market value of a property. In addition, local real estate and appraisal firms are often consulted to help assess the current market (NB Power; pers. comm.).

An appraiser hired by NB Power must be a Certified Residential Appraiser (CRA) or an Accredited Appraiser Canadian Institute (AACI). A member of the CRA is limited to appraising only vacant lands and single family dwellings. An AACI, in addition to vacant land and single family dwellings, is qualified to appraise multiple dwellings and structures.

NB Power has established standard land value prices based on existing and potential usage. If a property is close to a residential area or has road frontage/access then the land is valued higher because of its potential residential use.

5.4 Communications

Microwave and radio towers are located at several points near the proposed route, as follows:

Salisbury To Newcastle

- Adamsville - the nearest of the three tower sites is located 2.5 km east of the proposed route;
- Rogersville - the nearest of the two tower sites is located 3 km east of the proposed route;

Newcastle To Bathurst

- Ashton - the nearest of the tower sites is located on the Chaplin Island Road 12 km northeast of the terminal station;

Bathurst To Belledune

- South Tetagouche - this tower site is located 5 km west of the proposed route; and
- Guitar - the tower site is located on the Mitchell Settlement Road 5 km east of the proposed route.

5.5 Historic and Archaeological Resources

The proposed route has been selected to avoid all known sites; however, areas between known sites on the waterways, less significant water crossings and interior regions may also contain historic and prehistoric cultural remains. Only one known site, CfDj-26, judged by the Archaeology Branch of the Department of Tourism, Recreation and Heritage to be of low cultural significance, is located close to the proposed route. This site is known as the Poplar Grove site, is situated on the left bank of the Southwest Miramichi two km from the junction with the Northwest Miramichi. This area is particularly rich in historic and prehistoric sites.

CHAPTER SIX
BIOPHYSICAL IMPACT ASSESSMENT

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6.0 BIOPHYSICAL IMPACT ASSESSMENT

6.1 Basis For Impact Assessment

Following the study strategy described in Section 1.6, the biophysical impact assessment focuses on the evaluation of potential interactions between the various project activities, and Valued Ecosystem Components. To ensure that potential impacts are evaluated on a comparable basis for the proposed transmission line, the evaluation process is standardized. In addition to describing the nature of impact, the evaluation employs a numerical rating system to indicate the magnitude, duration, geographical extent and probable frequency of occurrence of expected interactions.

Potential impacts on Valued Ecosystem Components are assessed on the basis of a review of relevant literature, consultation with experts, and professional judgement. In some instances, the current state of knowledge or understanding of the sensitivity of certain Valued Ecosystem Components to construction and maintenance activities is limited, making impact predictions difficult. In such cases it is often necessary to rely primarily on professional judgement. As well, professional judgement is used in instances where required data on Valued Ecosystem Components are lacking. Ratings are therefore provided to indicate the level of confidence and range of uncertainty associated with each potential impact prediction.

The impact predictions presented in this chapter are also based on the following assumptions:

- impact predictions reflect the degree of refinement in study area boundaries and operating procedures that have occurred to the time of EIA preparation; and
- impact ratings given are those that would be expected to occur in the absence of any mitigative measures.

In the case of the second assumption, the impact predictions reflect "worst-case" situations. Residual impacts, or those impacts that are expected to remain following the adoption of all practical mitigative measures, are identified in Chapter Eight.

The biophysical impact assessment is organized by project component or activity as set out in Chapter Two. To facilitate a comparative evaluation of levels of impact along the proposed route, summary matrices are presented for each project activity indicating the impact ratings for each Valued Ecosystem Component. The impact assessment generally follows the following format:

- **potential interactions with Valued Ecosystem Components** -- a description of the degree to which Valued Ecosystem Components are exposed to each project activity;
- **issues and concerns** -- a statement of major concerns or hypotheses regarding the effects of each project activity on the species being considered;
- **existing knowledge** -- a review of current knowledge concerning the sensitivity of Valued Ecosystem Components to each project activity; and
- **impact prediction** -- an assessment of potential impacts associated with each project activity at each of the proposed training areas.

6.2 Evaluation of Biophysical Impact Significance

Biophysical impacts on Valued Ecosystem Components were ranked using four population based criteria, following the methodology described by Conover, et al. (1985):

- a **major** impact is defined as one affecting a whole stock or population of a species in sufficient magnitude to cause a decline in abundance and/or change in distribution beyond which natural recruitment (reproduction and immigration from unaffected areas) would not return that population, or any populations or species dependent upon it, to its former level within several generations;
- a **moderate** impact is defined as one affecting a portion of a population that results in a change in abundance and/or distribution over one or more generations of that portion of the population or any population dependent upon it, but does not change the integrity of any population as a whole; it may be localized;
- a **minor** impact is defined as one affecting a specific group of individuals in a population at a localized area and/or over a short period (one generation or less), but not affecting other trophic levels or the integrity of the population itself; and

- a **negligible** impact is one affecting the population or a specific group of individuals at a localized area and/or over a short period in such a way as to be similar in effect to small random changes in the population due to environmental irregularities, but having no measurable effect on the population as a whole.

In using population-based criteria as a basis for assessing the magnitude of impact, it is necessary to consider the spatial boundaries that characterize particular populations. The concept of ecological boundaries as a parameter governing the scope of environmental impact assessments is described in Section 3.3.3.

The system used to rate biophysical impacts is illustrated in Figure 6-1. The impact of each interaction between a project component or activity and a Valued Ecosystem Component is rated as negligible, minor, moderate or major using a series of circular symbols. When a positive impact is predicted a "+" sign appears over the impact rating symbol. The absence of a "+" sign indicates that the impact will be negative. An asterisk below the impact rating symbol indicates that the impact will be indirect, i.e., the project activity affects the Valued Ecosystem Component by altering its environment or food supply rather than by directly affecting the organism.

Numerical modifiers that appear in each cell of the matrix (Figure 6-1) provide additional information on the nature of the interaction and the level of confidence associated with the impact ratings. The number in the upper right-hand corner is a rating, on a scale of one to three, of the level of confidence the study team had in the impact prediction. A rating of one would indicate that existing scientific data on the effects of that type of interaction are insufficient to confidently predict the nature and magnitude of impact, whereas a rating of three would indicate that there is a strong basis for the prediction that is made. The range of possible impact ratings is indicated in the lower right-hand corner of the cell.

Numbers in the lower left-hand corner provide information on the duration and frequency of interactions between project activities and Valued Ecosystem Components. Interactions that are expected to occur throughout the life of the project are assigned a duration rating of five. Interactions that occur as discrete events (e.g., maintenance activities) are categorized by their expected frequency of occurrence within a year. Other interactions are indicated by the number of days per year in which a particular training activity will occur. A rating of six is used to indicate interactions that are expected to take place continuously over extended periods of time. The number in the upper left-hand corner indicates the total area likely to be affected by the interaction.

6.3 Impacts of Construction

6.3.1 Mammals

6.3.1.1 White-tailed Deer

Potential Interactions

The proposed route will cross two current and one former deer wintering areas (DWAs) (Figure 4-1) which will be cut. Although transient, construction activities will occur for several days within the deer wintering areas. This is only applicable to the Salisbury to Newcastle and Newcastle to Bathurst portions of the route where the line crosses actual DWAs (Section 4.1.1).

Issues and Concerns

A number of wintering deer may be exposed to construction activities, if construction occurs during the winter. Wintering areas are critical in all of New Brunswick, but especially so in the north due to the severity of the winters. The major concerns are the timing of powerline construction (G. Redmond, pers. comm.); and the noise generated by construction activities. The impact of habitat loss is considered in Section 6.4.1.1.

Existing Knowledge

In most years deer enter their traditional wintering areas by late December and leave by early April, although in severe winters this period is extended (Marchinton and Hirth 1984).

Deer adapt physiologically to winter by decreasing their mobility and their metabolic rate; their energy reserves (body fat) are at their lowest just before spring (Marchinton and Hirth 1984). The noise of construction activity during winter can approximate the noise of snowmobiles, which can result in elevated heart rates, stress and thus higher energy expenditures in deer which can hear the machines (A. Boer, pers. comm.). The effects of snowmobiles on deer movements and activity is proportional to the degree of snowmobile use (Matschke, et al. 1984). Although deer can be very sensitive to disturbance, to the extent of moving home ranges because of snowmobile activity, light snowmobile activity had little effect (Dorrance, et al. 1975; Matschke, et al. 1984). Moen (1976) indicated that any disturbance which alters deer activity patterns can depress productivity, since deer winter behaviour is adapted to conserve energy.

In any given year that construction will take place, the earliest and latest dates for the three phases of construction (Section 2.10.1.1) is planned as follows:

- the survey of the centreline is planned to span all months;
- clearing between April 1 and November 30; and
- line construction between March 1 and November 30.

Potential Impacts

Construction activities will only have impact on deer within traditional wintering areas if any of the three phases occurs between late December and early April. Line construction scheduled to take place commencing March 1, if occurring within a DWA, will stress deer, similar to that produced by snowmobile activity. Clearing scheduled to commence April 1 could also have an impact on wintering deer in late winters. The impact of construction in DWAs during the critical period is rated as a minor negative impact for Salisbury to Newcastle and Newcastle to Bathurst, but negligible for Bathurst to Belledune. This assumes that construction will occur during the critical period.

6.3.1.2 Moose

Potential Interactions

The transient construction activity will interact with moose populations along the right-of-way.

Issues and Concerns

Short-term construction activities may disturb moose sufficiently to displace them from their existing habitat. Concerns relating to the loss of habitat will be addressed in Section 6.4.1.2.

Existing Knowledge

Moose are common throughout New Brunswick; however, quantitative data on the abundance and distribution of this species along the proposed route are lacking. Moose do not form wintering concentrations to the same extent as deer (G. Godin, R. Currie, T. Pettigrew, pers. comm.). Moose are not as affected by snow conditions as deer and are therefore more mobile and not restricted to traditional wintering areas during the December to April period. Moose congregate in groups of from three to four up to a high of 20 in east central New Brunswick (R. Currie, G. Godin, T. Pettigrew, pers. comm.), and are known to use the same wintering area as deer on occasion, but usually remain mutually exclusive (R. Currie, pers. comm.). Habitats used during January to March, when moose aggregations were smallest, have been shown to be dependent upon snow characteristics and weather conditions (Peek 1971).

Potential Impacts

Since moose do not form wintering areas to the same extent as deer, and since winter conditions are not as critical as for deer, the scheduling of construction in winter is expected to have negligible impacts on moose.

6.3.1.3 Marten

Potential Interactions

Transient construction activity is anticipated to affect pine marten in the Newcastle to Bathurst and Bathurst to Belledune portions of the proposed route.

Issues and Concerns

The most important measure of an impact on marten is the degree to which it effects population levels within a particular area over time. There are two major concerns regarding the noise of heavy equipment used in right-of-way clearing and transmission line construction:

- that disturbance will cause marten to abandon or make less use of preferred or traditional habitats, leading to a reduction in density; and
- that disturbance will affect reproductive success, resulting in reduced recruitment and population size.

Concerns relating to loss of habitat will be addressed in Section 6.4.1.3.

Existing Knowledge

Marten populations exist mainly in the area north of Newcastle, although there may be small numbers in the Salisbury to Newcastle portion of the proposed route. The periods of greatest sensitivity to disturbance for marten are thought to include the breeding season (June and July) and the subsequent natal denning period (late March and April of the following year), however, no information is available to indicate if disturbances during these periods are harmful (WMS 1990a).

Potential Impacts

The population of marten is low and dispersed, with most of the population occurring north of Newcastle. The impact on marten south of Newcastle is thus considered not applicable. The most critical period in the breeding cycle is the natal denning period of late March and April when females are not able to avoid the impacts of construction. Most construction will occur after April 1 when adults and young will be able to avoid areas under construction. The impacts on marten are thus expected to be negligible for all portions of the proposed route.

6.3.2 Birds

6.3.2.1 Waterfowl

Potential Interactions

Construction noise may affect waterfowl.

Issues and Concerns

The major concerns for waterfowl are primarily the noise of chainsaws and heavy equipment used in right-of-way clearing and transmission line construction. The possibility exists that:

- disturbance will cause waterfowl to abandon or make less use of preferred or traditional habitats, leading to a reduction in density; and
- disturbance will affect reproductive success, resulting in reduced recruitment and population size.

Existing Knowledge

The noise of heavy machinery used during clearing will be similar to that produced by aircraft. Waterfowl are most sensitive to noise (aircraft) while concentrated on staging or wintering areas. Studies have shown that waterfowl respond more strongly to disturbance during non-breeding periods than during the nesting season (Gunn and Livingston 1974; Gladwin, et al. 1988; State of Nevada 1987).

Potential Impacts

Since there are no major waterfowl staging or wintering areas situated along the proposed route, and since important wetlands are generally avoided, the impacts of construction on staging and breeding waterfowl will be negligible.

6.3.2.2 Upland Game Birds

Potential Interactions

Upland game birds are distributed throughout the area containing the proposed route, therefore interactions with the clearing and construction of the transmission line will occur along the entire proposed route.

Issues and Concerns

There will be some possibility of mortality and nesting failure in spring of ground-nesting grouse due the disturbance of clearing and construction. Loss of habitat will be addressed in Section 6.4.2.2.

Existing Knowledge

Ground-nesting grouse are sensitive to the disturbance of clearing and construction in spring.

Potential Impacts

Although there is some possibility of mortality and nesting failure in spring of ground-nesting grouse, these effects will not be measurable at the population level. Broods which are precocial will normally be able to avoid construction activity. The impacts of clearing and line construction will thus be negligible.

6.3.3 Fish

6.3.3.1 Atlantic Salmon and Brook Trout

Potential Interactions

Surveying, clearing and construction and vehicular traffic along the proposed route will result in stream crossings and runoff which may interact with fish and fish habitat.

Issues and Concerns

Watercourse crossings during the surveying, clearing and construction phases of the proposed route may affect fish and fish habitat. Erosion and runoff associated with vehicular traffic may also affect fish and fish habitat.

A variety of effects resulting from watercourse crossings may occur. Of these, the principal concerns associated with the construction of the proposed transmission line are that construction activities will cause:

- displacement of fish;
- siltation of spawning habitat;
- loss of bank cover;
- loss of food supply;
- impedance of feeding due to turbidity; and
- blockage of fish passage.

Existing Knowledge

Many of the 93 streams crossed by the proposed route have never been surveyed and relatively no information is known. Streams along the proposed route are rich in brook trout and Atlantic salmon habitat. It can be assumed generally that any streams that are not intermittent and flow year round provide a certain amount of habitat and could support populations of these and other species.

Clearing, construction and vehicular traffic may result in soil erosion and silt deposition in water bodies. Siltation is relatively localized in ponds, where minimal impacts on fish populations, such as reduced feeding efficiency and growth, may result. Alabaster (1972) reports that adult fish are rarely affected directly unless high concentrations (>90 mg/l) are sustained. In rivers, salmonid populations can be affected by degradation in water quality and suffocation of eggs in spawning beds (LGL 1983). Silt can also reduce stream productivity by accumulating on substrates that serve as habitat for both fish and aquatic invertebrates.

There is considerable information available on construction impacts on stream biota, especially with respect to road crossings and siltation. Chapman (1988) provided a critical review of field and laboratory studies directed at evaluating the effects of fine sediments on survival to alevin emergence in redds of large salmonids in streams. The author concluded that research generally supports the hypothesis that survival declines in substrates as quantities of fine sediments increase.

Culvert installation can produce velocity barriers which hamper upstream movement of spawning adults, and prevent movement of juveniles (McCubbin, et al. 1985). Also, improperly installed culverts can result in physical barriers to fish passage.

The loss of riparian vegetation can degrade aquatic habitat. Review papers have summarized these impacts and have presented measures for reducing and mitigating such effects (McCubbin, et al. 1985; Platts, et al. 1983). Loss of shade vegetation can increase solar energy exposure so that water temperatures are elevated. It can also increase predation by removal of protective cover. As well, streamside vegetation is a source of drift (leaf fall, terrestrial insects) which provide nutrient and food input to the stream. Loss of vegetation can reduce this input. Reduced streambank stability can result from damage to riparian vegetation. In turn, this can result in erosion as fines enter the stream, and the character of the adjacent stream substrate is altered.

Some direct mortality could occur due to direct contact of vehicles fording streams. This would particularly be the case with eggs, fry and alevins.

Potential Impacts

Siltation and aquatic habitat alteration due to watercourse crossings during the construction phase could, without mitigation, have minor impacts on Atlantic salmon and brook trout in some streams. However, with construction procedures normally practised by NB Power and compliance with watercourse alteration permits, these impacts will be confined in extent and are likely to be temporary in nature. Further, many of the larger, more important streams cannot be forded due to depth, width or other physical constraints. Overall, the impact of construction on Atlantic salmon and brook trout is rated negligible.

6.3.4 Rare, Threatened and Endangered Species

Due to the lack of knowledge on the location and number of cougar and lynx along the proposed route, it is difficult to assess the likelihood of construction impacts on these species. The possibility of a minor or greater impact on these species due to transient transmission line construction is extremely low and does not warrant further discussion. Discussion of the impact of the potential loss of habitat is deferred to consideration of operation activities (Sections 6.4.4.1 and 6.4.4.2).

6.3.4.1 Bald Eagle and Osprey

Potential Interactions

Clearing and construction could interact with bald eagles and ospreys which are nesting near the proposed right-of-way. There are no known nests in the vicinity of the proposed right-of-way, but new nests could exist at the time of construction.

Issues and Concerns

During nesting, construction noise and human presence could affect nesting success and feeding behaviour.

Existing Knowledge

The adverse impacts of transmission line construction on bald eagles and osprey include (Olendorff, et al. 1981):

- loss of habitat through right-of-way clearing, construction of access roads and actual placement of towers and conductors; and
- disturbance of birds through interference with courtship, nest building, incubation and foraging which leads to desertion of nearby natural nests and roosts.

Generally, activity will be affected in the immediate area during construction, and nests that are close to the right-of-way can be deserted (Stahlecker 1975, cited in Olendorff, et al. 1981).

Potential Impacts

As there are presently no known nests along the proposed right-of-way, impacts of construction on bald eagles and ospreys is expected to be negligible. If bald eagle nests are built near the line during construction, there could be some minor impacts if the construction activity occurs during the nesting period within close proximity to the nest. The probability of this occurring is extremely low. The overall impact on bald eagles and osprey are thus rated negligible.

6.3.5 Water Quality

6.3.5.1 Potential Interaction

Clearing, construction and vehicular traffic could result in water quality degradation through associated runoff and erosion, or directly through fording.

6.3.5.2 Issues and Concerns

There is concern that construction activities will introduce deleterious substances into watercourses. The principal concern is for siltation and associated impacts on turbidity, colour and suspended solids and through the introduction of hydrocarbons by vehicles fording streams.

6.3.5.3 Existing Knowledge

Water quality in streams along the proposed route is generally very good (Sections B.1.14 and 4.6).

6.3.5.4 Potential Impacts

Fording of watercourses may result in some short-term water quality impacts due to bank erosion, dirty tracks or wheels, disturbance of the stream bed or the introduction of hydrocarbons due to small leaks and drips. The impact of this activity would be transient and is rated negligible.

Vehicular traffic along the right-of-way may result in some rutting and related terrain disturbance. This can result in the concentration of runoff and can cause longer term erosion. The impact of this activity could result in minor impacts on some streams. However, given the construction procedures normally practised by NB Power and the procedures outlined in watercourse alteration permits, the overall impact of construction on water quality is rated negligible.

6.3.6 Summary

The impacts of construction on various Valued Ecosystem Components are summarized in Figure 6-2.

6.4 Impacts of Operation/Maintenance

6.4.1 Mammals

6.4.1.1 White-tailed Deer

Potential Interactions

Although little maintenance would occur in winter with the exception of emergency repairs, white-tailed deer will likely be exposed to operational activity year round. Most of this activity would be of a transient nature; inspection and maintenance crews would not spend a lot of time in any one area. In the two present and one former DWAs (Section 4.1.1), deer may be exposed to the effects of the operation and maintenance during this critical period. Also, deer will be exposed to snowmobiles and other recreational users who will use the right-of-way. In future, due to the dynamic nature of DWAs, exposure may occur in newly developed DWAs along the right-of-way.

Issues and Concerns

Wintering areas are critical in all of New Brunswick, but especially so in the north due to the severity of the winters.

The major issue and concern is the establishment of a right-of-way through a DWA would provide access for illegal hunters, for snowmobiles who may intentionally or unintentionally disturb or harass the wintering deer, and for dogs and coyotes which will travel along snowmobile trails (A. Boer, pers. comm.; Doucet, et al. 1981; Matschke, et al. 1984). There will be very little or no maintenance activity in winter by NB Power and thus their activities are of little concern. Right-of-way use by NB Power and other users is less of a concern during the rest of the year when deer are less sensitive and more widely distributed in their habitat.

Existing Knowledge

DNRE has stated that the final route should be chosen so as to minimize the impact on DWAs (P. Kehoe, pers. comm.). This has been achieved by the Route Selection Study (Appendix B) with the exception of two present and one former DWAs (Section 4.1.1). Generally, DNRE protects DWAs, but does allow limited forest harvesting in up to 30 percent of a wintering area (G. Redmond, pers. comm.). The proportion of DWAs lost along the route is significantly less than this (Table H-1, Appendix H). DWAs are considered as environmentally sensitive areas by DNRE, and are protected from adverse cutting operations (Boer 1978).

Several studies have examined deer use of right-of-ways. Cavanaugh, et al. (1976) found more white-tailed deer observations and higher levels of browse use were associated with a three year-old selectively cut right-of-way; use was dramatically lower for a 50 year-old right-of-way and the adjacent undisturbed forested site. Bramble and Byrnes (1981) reported that right-of-ways have a significantly greater habitat value for white-tailed deer than adjacent forests, based on the relative abundance and diversity of important food items, cover, cover type interspersion, and successional stage of the right-of-way.

Eaton and Gates (1981) observed that white-tailed deer seemed to increase their activity in the vicinity of right-of-ways in response to greater availability of browse and the proximity of cover and shelter. However, a preliminary study by Doucet, et al. (1981) near Montreal, Quebec, found that deer use of a traditional DWA was affected significantly by a 30 m right-of-way passing through the yard. They concluded that deer use of the right-of-way in winter was limited to crossings only, and that this was a result of lack of hiding and thermal cover, increased snow depths and human harassment. However, deer spent more time loafing and browsing when crossing the corridor as vegetation density increased with age.

The proposed route transects two present and one former DWAs (Figure 4-1) (Section 4.1.1).

Deer adapt physiologically to winter by decreasing their mobility and their metabolic rate; their energy reserves (body fat) are at their lowest just before spring (Marchinton and Hirth 1984). The noise of snowmobiles can result in elevated heart rates, stress and thus higher energy expenditures in deer which can hear the machines; excessive use of snowmobiles in a wintering area can keep deer away from the open right-of-way during the day (A. Boer, pers. comm.). The effects of snowmobiles on deer movements and activity is proportional to the degree of snowmobile use (Matschke, et al. 1984). Although deer can be very sensitive to disturbance, to the extent of moving home ranges because of snowmobile activity, light snowmobile activity had little effect (Dorrance, et al. 1975; Matschke, et al. 1984). Moen (1976) indicated that any disturbance which alters deer activity patterns can depress productivity, since deer winter behaviour is adapted to conserve energy.

Snowmobile use can also have beneficial effects for deer (Matschke, et al. 1984). Deer became accustomed to snowmobile use in Maine, and the creation of trails actually reduced energy expenditures and improved access to better feeding conditions, thus enhancing overwinter deer survival (Richens and Lavigne 1978).

Right-of-ways through wintering areas also provide access for predators such as coyotes and dogs which often follow snowmobile tracks (A. Boer, pers. comm.). Dogs can severely affect deer in wintering areas in New Brunswick (A. Boer, pers. comm.); other studies showed that dogs are ineffective predators of deer and have no detrimental effect (Marchinton and Hirth 1984), but that such predation can occasionally be substantial (Cypher and Cypher 1988). Although dogs can be a nuisance in wintering areas, the overall effect on deer is unknown (Huot, et al. 1984). Even if dogs do not actually catch and kill deer, the chasing and harassment can cause deer to expend valuable energy resources; 75 percent of dog kills are female deer, and most of those are pregnant (A. Boer, pers. comm.). Dogs are common in communities situated near deer wintering areas in New Brunswick. Coyotes are common in New Brunswick (D. Cartwright, pers. comm.), and contribute a significant percentage of the total yearly non-hunting mortality during the January to March period when deer are yarding (Table 6-1).

The removal of a portion of a deer wintering area by construction of a transmission line right-of-way is similar in impact to that of the forest industry. In some cases, wintering areas have been improved by selective cutting or by patch cuts by the forest industry in cooperation with DNRE (Boer 1978). For this transmission line, DNRE requested that the right-of-way:

- pass through a hardwood or mixed wood stand rather than a critical softwood shelter stand; and
- not fragment the wintering area (T. Pettigrew, pers. comm).

Although patch cuts tailored to individual stands are more compatible with stand management than are strip cuts, the forest industry appears to favour strip cuts (Boer 1978). The 50 m right-of-way approximates forest industry strip cuts in extent and impact.

Right-of-ways constructed through forested terrain may also result in high windchill factors and snow drifting from a wind tunnel effect, with winds oriented along the length of the line (A. Boer, pers. comm.; Doucet, et al. 1981). Doucet, et al. (1981) found that deer in a wintering area near Montreal, Quebec, limited their use of a right-of-way to crossings only, and did not stop to browse; they attributed this to the lack of cover, the wind tunnel effect, and adverse snow conditions. Brusnyk and Westworth (1985) suggested that deer used a pipeline right-of-way in Alberta as a travel corridor in early winter before snow conditions restricted their movements.

Impacts may also be generally beneficial, such as the increased browse created along the right-of-way. Opening up a deer wintering area is also generally positive, as browse is created within the wintering area, especially during the early successional stages.

The best combination of food and cover is contained within mixed stands opened by partial cuts (Huot, et al. 1984). Boer (1978) and Boer, et al. (1982) list several recommendations which should be followed when managing a deer wintering area in the face of cutting. These recommendations are designed to result in the establishment of four to six or more age classes, and a constant and moderate level of habitat productivity rather than an extreme fluctuation. The recommendations are:

TABLE 6-1. NON-HUNTING MORTALITY OF DEER DURING 1989 IN FOREST ADMINISTRATION REGIONS 2 AND 3, WITH EMPHASIS ON THE JANUARY, FEBRUARY, MARCH DEER WINTERING AREA PERIOD.[1]

REGION 2

PERIOD	RK	RR	POA	STV	DOG	COY	UNK/OTH	TOTAL
Jan.	3	0	0	0	1	11	8	23
Feb.	1	1	1	0	0	29	9	41
Mar.	3	0	0	0	3	40	11	57
Apr.-Sep.	63	0	0	0	0	10	12	85
Oct.-Dec.	24	1	4	0	0	8	5	42
TOTAL	94	2	5	0	4	98	45	248
%	37.9	0.8	2.0	0	1.6	39.5	18.1	99.9

REGION 3

PERIOD	RK	RR	POA	STV	DOG	COY	UNK/OTH	TOTAL
Jan.	15	0	1	0	1	11	6	34
Feb.	9	0	0	0	3	11	1	24
Mar.	6	0	0	0	2	7	2	17
Apr.-Sep.	296	4	1	0	0	2	10	314
Oct.-Dec.	185	1	28	0	0	2	13	228
TOTAL	511	5	30	0	6	34	31	617
%	82.8	0.8	4.9	0	1.0	5.5	5.0	100.0

SOURCE: G. Godin, R. Currie, T. Pettigrew (pers. comm.)

[1] Region 1 was not summarized due to low non-hunting mortality totals.

RK = road kill; RR = railroad; POA = poaching; STV = starvation; DOG = domestic dog; COY = coyote; UNK/OTH = unknown and other

- 50 to 60 percent of the wintering area should consist of spruce and fir, 10 m or higher, with at least 70 percent crown closure;
- only limited cutting should be permitted in small deer wintering areas;
- individual openings should not exceed 4 ha, and should be separated by uncut areas at least equal in size to the cut areas; cuts should be no wider than 60 m; narrow wintering areas should not be fragmented;
- travel lanes through uncut strips should be left attached to adjacent shelter areas;
- cutting plans should be geared to maintain at least 50 percent of the wintering area in suitable shelter stands;
- cutting should be compatible with land use of adjacent areas; cutting in adjacent areas should be kept to a maximum of 20 percent; strip or patch cutting should be encouraged; and
- cutting of fir should be encouraged over spruce, and cedar and hemlock should be protected.

Potential Impacts

Maintenance activities within a DWA during the winter will be rare and thus will result in no impact on wintering deer. Secondary impacts along the right-of-way due to snowmobile activity, illegal harvesting and predation by dogs and coyotes will likely be greater and are rated as minor negative in the Salisbury to Newcastle and Newcastle to Bathurst portions of the proposed route where DWAs are known, and negligible between Bathurst and Belledune.

The impact of other maintenance and recreational activity during the rest of the year is rated as negligible (negative). In most areas, the cutting of forested land will create excellent habitat for browse with nearby adjacent cover and the impact of this is rated as negligible (positive).

Despite some positive impacts, the importance of DWAs influence the overall impact ratings. The net impact of operation (largely due to secondary impacts such as illegal harvesting and predation) is rated as minor negative between Salisbury and Newcastle and Newcastle to Bathurst, and negligible negative between Bathurst and Belledune.

6.4.1.2 Moose

Potential Interactions

Moose will use the right-of-way extensively and will thus interact with operations activities and secondary users.

Issues and Concerns

The principal concern for moose along the proposed right-of-way would be for potential harassment and disturbance by secondary users. The frequency of maintenance activities and the relatively lesser sensitivity of moose to disturbance suggests that these activities are of little concern.

Existing Knowledge

In New Brunswick, winter habitat for moose is seldom managed (A. Boer, pers. comm.). Moose wintering areas are distributed across the region traversed by the proposed route. Brusnyk and Westworth (1985) found that moose showed a strong response to the increased browse availability in a 17 year-old pipeline right-of-way in Alberta, which agrees with other studies which demonstrate that moose distribution is principally affected by browse availability (Telfer 1978; Westworth, et al., 1984). Telfer (1978) observed that moose responses to greater available browse biomass showed considerable yearly and regional variation; however, the areas with the highest browse production generally produced the most moose. Brusnyk and Westworth (1985) also found that moose preferred deciduous dominated mixed wood habitats over habitats with a high conifer component. Although the limited use of coniferous habitats along the right-of-way observed for moose may be related to a general lower density of moose in coniferous habitats, the pipeline right-of-way may also provide a travel corridor between higher density and more diverse deciduous habitats (Brusnyk and Westworth 1985).

Non-hunting mortality factors accounted for most of the annual moose mortality in New Brunswick (Boer 1988). Moose non-hunting mortality for 1989 in Forest Administration Region 2 indicated that road kills were the major mortality, followed by poaching (R. Currie, pers. comm.). Coyote and dog predation was not a factor.

Potential Impacts

The availability of habitat does not appear to be a limiting factor to moose populations in New Brunswick (Section B.3.8.2, Appendix B), thus although positive, the impacts of the creation of the right-of-way and its use by moose during the spring, summer and fall are expected to be negligible. The impact of maintenance activity is expected to be transient and negligible negative. The impact of secondary users of the right-of-way for creation and possibly illegal harvesting would be more significant, but also negligible negative. The net overall impact of the introduction of a right-of-way into an area used by moose is therefore expected to be negligible negative.

6.4.1.3 Marten

Potential Interactions

The proposed transmission line right-of-way will traverse pine marten habitat, mainly north of Newcastle. Maintenance and secondary use of the right-of-way will interact with pine marten.

Issues and Concerns

There is concern that important marten habitat will be lost when the 50 m right-of-way traverses preferred marten habitat. Marten are distributed throughout the area along the proposed route, especially north of Newcastle. There is also concern that mortality or disturbance would occur due to maintenance or secondary use of the right-of-way.

Existing Knowledge

The marten is common in the northern third of New Brunswick (Hutchinson 1985; Dilworth 1974), mainly in the area north of Newcastle. Mature or over-mature conifer and mixed wood forests are generally their preferred habitat (Soutiere 1979; Steventon and Major 1982).

Mature stands within Timber Licences 1 and 2 (northern New Brunswick) and 3 and 4 (central New Brunswick) (Figure B-8, Appendix B) account for 27.9 percent and 22.3 percent, respectively, of the stands along the proposed right-of-way in these areas (Table 4-1).

Potential Impacts

Marten are uncommon within Timber Licences 6 and 7 (Figure B-8, Appendix B) and thus interaction with this species between Salisbury and Newcastle would be very limited. The impact on marten is thus considered not applicable along this portion of the route.

The impact upon marten within Licences 3 and 4, the portion of the proposed route generally between Newcastle and Bathurst, is expected to be negligible, as the proposed right-of-way will parallel the existing transmission line, and only 22.3 percent of the stands along its length within the Licences are mature (Table 4-1).

The impact on marten within Licences 1 and 2 is slightly greater, as 27.9 percent of the stands are mature (Table 4-1). However, portions of the proposed route are parallel to an existing transmission line between Bathurst and Belledune, and are adjacent to communities where marten populations are expected to be low. The impact along this portion of the right-of-way is thus also rated negligible.

6.4.2 Birds

6.4.2.1 Waterfowl

Potential Interactions

Waterfowl generally move frequently among and between wetlands and along the river valleys, especially in migration periods. Wetlands have been avoided by the proposed route, and thus the proposed transmission line will not interact greatly with waterfowl. There may be some interaction of transient maintenance activities with breeding waterfowl in small wetlands or along river valleys, and by secondary users of the right-of-way.

Issues and Concerns

There may be waterfowl mortality due to collision with conductors and towers, especially near wetlands or along river valleys. There may be some transient disturbance of breeding waterfowl by maintenance crews and secondary users.

Existing Knowledge

There is one Ducks Unlimited project scheduled for an area west of Harcourt, near the proposed route. DU personnel see no problem with the coexistence of their project and the proposed route unless a transmission tower is situated directly on a dyke or dam (A. McInnes, pers. comm.). Bird strikes against towers and conductors are uncommon.

Wetlands have been avoided by the proposed route but there are waterfowl populations throughout the study corridor (Sections B.1.8.1 and 4.2.1). Several major river valleys cross the proposed right-of-way and thus contain some waterfowl habitat.

Potential Impacts

Along river valleys and in wetland areas, it is expected that there may be occasional mortality due to waterfowl striking conductors. The impact of this is expected to be negligible negative.

There may be some disturbance of breeding waterfowl in small wetlands or along river valleys. This could affect nesting success or result in direct mortality of broods. The impact of this however is rated negligible negative.

6.4.2.2 Upland Game Birds

Potential Interactions

The presence of a cleared right-of-way will provide foraging habitat but would also result in a loss of nesting cover.

Issues and Concerns

There is concern that there will be a net loss of nesting cover.

Existing Knowledge

Grouse are distributed throughout the study corridor.

Potential Impacts

The creation of foraging habitat along the right-of-way would result in a negligible positive impact. However, the loss of 1,250 ha of forested land would result in a negligible negative impact due to the loss of nesting cover. The overall net impact is rated negligible negative.

6.4.3 Fish

6.4.3.1 Atlantic Salmon and Brook Trout

Potential Interactions

Transient maintenance activities and the activities of secondary users will result in stream crossings and vehicular traffic which may interact with fish and fish habitat.

Issues and Concerns

Watercourse crossings may affect fish and fish habitat during maintenance. Erosion and runoff associated with vehicular traffic may have similar effects. The list of potential effects associated with construction activities in Section 6.3.3.1 also applies to maintenance activities and secondary use of the right-of-way.

Existing Knowledge

Discussion of existing knowledge relative to construction is directly applicable to operation (Section 6.3.3.1).

Potential Impacts

The discussion of impacts due to construction in Section 6.3.3.1 is directly applicable. However, the activities of secondary uses during operation would be difficult to control and could result in greater impacts. Thus, overall, the impact of operation due primarily to the activities of secondary users is rated minor negative.

6.4.4 Rare, Threatened and Endangered Species

6.4.4.1 Eastern Cougar

As discussed in Section 6.3.4, due to the lack of knowledge of the location and number of cougar along the proposed route, it is difficult to assess the likelihood of operation-related impacts on this species. The probability of minor or greater impact is extremely low due to the transient nature of operation-related activities.

The loss of 1,250 ha of forested land along the entire length of the right-of-way is expected to have no impact on cougar if the home range of any individuals is traversed by the proposed right-of-way. The home range of a cougar has been cited as being as great as 100 km^2; they patrol their home range along set trails which may be 20 to 30 km in length (Banfield 1974).

6.4.4.2 Lynx

No impact on lynx is expected due to operation for reasons similar to that noted for cougar (Section 6.4.4.1). The home range of lynx is 17 to 22 km^2 and they have an average daily cruising range of 4 km (Banfield 1974).

6.4.4.3 Bald Eagle and Osprey

Potential Interactions

Ospreys use transmission line towers as nesting platforms, or as observations posts for hunting. There is no known use of transmission line towers in New Brunswick by bald eagles.

Issues and Concerns

Creation of the right-of-way can result in a greater diversity of avian life created by the greater edge, although some forest habitat will be lost as a direct result of cutting. Since major river valleys such as the Miramichi River are often migration corridors for birds, transmission lines crossing them may be the source of bird collisions with the conductors and towers.

Fudge, Lane and Associates (1987), based on research in Newfoundland on the impacts of a proposed transmission line, and Olendorff, et al. (1981), have identified disturbance from maintenance activities and the operation of the line, including electrocution, collision with conductors, and harassment by man, as the direct potential impact of transmission lines on raptors.

Long sticks, and sometimes the birds themselves on transmission towers may sometimes span the distance between the tower and a conductor and cause flashovers, particularly in wet weather, if a nest is built over a suspended insulator. This situation may change over the years as raptors such as ospreys normally enlarge the nest structure every year (Olendorff, et al. 1981). Excrement from the birds will also foul the insulators causing a lessening of efficiency. Power outages can also occur.

Existing Knowledge

Most transmission lines that electrocute raptors carry between 12 and 69 kV (Benson 1980, from Olendorff, et al. 1981); these have conductors spaced close enough together to be spanned by the outstretched wings of a large bird. The spacing between conductors on a 345 kV line are sufficiently great that it would be impossible for raptors to be electrocuted.

Raptor collisions with utility lines can result in serious declines of critically endangered species (Olendorff and Lehman 1986), but such is not the case with osprey in New Brunswick. For relatively common species such as osprey and other raptors, collision with utility lines is a random, low level, and inconsequential mortality factor (Olendorff and Lehman 1986). Raptors are usually able to avoid utility lines because they have keen eyesight, are manoeuvrable in flight, do not fly in flocks where position and altitude are determined by that of other birds in the flock, and have usually become conditioned to conductors and poles which are used for perching and nesting (Olendorff and Lehman 1986). This is expected to be the case for the bald eagles of Beaubears Island at Newcastle.

Increased accessibility by man to previously undisturbed areas is usually the greatest long-term impact of transmission line construction of wildlife (Olendorff, et al. 1981). This leads directly to illegal shooting of roosting and nesting birds. The frequency with which raptors are shot off transmission lines and their support structures is related to the distance between the lines and the nearest road (Olendorff, et al. 1981). Although there are numerous public roads along the proposed route increased mortality of raptors due to shooting is not considered a serious problem.

Although most ospreys nest in trees in New Brunswick (Stocek and Pearce 1983), ospreys will in fact benefit from placement of transmission line towers, as the towers provide nesting opportunities in favoured habitat. In 1989 there were 74 osprey nests on transmission lines in New Brunswick (NB Power, pers. comm.). None of these were on lines adjacent to the proposed route. This habit is advantageous because it provides the birds with good nest sites but increases their susceptibility to human disturbance, electrocutions and power interruption caused by hanging material. According to Stocek (1972), ospreys will nest on utility poles in New Brunswick and have in the past. NB Power currently removes or trims osprey nests only if they pose a danger to the utility, and then only after the birds have completed their nesting activity. Where it is necessary to remove nests, nesting platforms are constructed adjacent to the line. This activity is part of a joint NB Power-DNRE stewardship program.

Potential Impacts

The proposed electric transmission line will be 345 kV and the conductors will be spaced 10 m apart (NB Power, pers. comm.). Since female bald eagles, the largest raptor in the study area, have a wingspan of 1.98 - 2.25 m (Godfrey 1986), electrocution will not occur; there will thus be no impact on bald eagles and osprey.

Mortality due to raptors colliding with transmission lines will likely be minimal (Stocek 1981). Such impacts have the potential of occurring at almost any location along the length of the transmission line right-of-way. The impacts due to collisions on ospreys and bald eagles is thus rated as negligible negative.

Ospreys in New Brunswick often nest near large bodies of water, and frequently on transmission line towers. Because of nesting opportunities presented, the impact on nesting ospreys is expected to be minor positive. No impact on non-nesting ospreys is expected.

The proposed route passes approximately 2.5 km to the west of the nest on Beaubears Island. Because this nest is located in an area of diverse industrial activity, including the presence of other transmission lines, the addition of the proposed route is expected to have no impact on this nest.

Bald eagles do not generally nest on transmission line structures east of Ontario (Stocek 1981). If this does occur, it would be considered a minor positive impact.

Overall, the net impact on osprey is rated minor positive due to nesting opportunities. Overall, the net rating for bald eagle is no impact due to the low likelihood of potential impact or interaction.

6.4.5 Air Quality

6.4.5.1 Ozone

Potential Interaction

Ozone produced by the proposed line will be released to the atmosphere.

Issues and Concerns

Ozone is the principal component of several oxiding gases known as total oxidants (Eaton, et al. 1986). Ozone is beneficial in the stratosphere, where it shields the earth from ultraviolet radiation. However, at ground levels, it is considered as a pollutant for flora and fauna and man.

Existing Knowledge

The current Canadian Clean Air Act Guidelines set the maximum desirable, maximum acceptable and maximum tolerable limits for ambient oxidents (ozone) (Section B.1.13.1, Appendix B).

Potential Impacts

The maximum predicted level of ozone along the right-of-way are provided in Section 2.7. These levels are extremely low in comparison with the Guidelines (Section B.1.13.1, Appendix B). The impact of operation on ozone levels along the right-of-way is therefore rated negligible.

Ozone levels as cited in Section 4.5 are low, therefore the impacts on air quality along the proposed right-of-way are negligible.

6.4.6 Water Quality

6.4.6.1 Potential Interactions

Operation and secondary use activities could result in water quality degradation through associated runoff and erosion, or directly through fording.

6.4.6.2 Issues and Concerns

There is concern that maintenance activities and secondary use will introduce deleterious substances into watercourses. The principal concern is for siltation and associated impacts on turbidity, color and suspended solids and through the introduction of hydrocarbons by vehicles fording streams. Due to the lack of control, secondary users may also develop illegal or improper crossings or conduct activities which can only be afforded as a result of new right-of-way access.

6.4.6.3 Existing Knowledge

Water quality in the streams along the proposed route is generally very good (Section B.1.14, Appendix B; and Section 4-6).

6.4.6.4 Potential Impacts

The fording of watercourses by NB Power may result in some short-term water quality impacts due to bank erosion, dirty tracks or wheels, disturbance of the stream bed or the introduction of hydrocarbons due to small leaks and drips. The impact of this activity would transient and is rated negligible. Activities by secondary users could be greater, but is also rated negligible, particularly assuming that most activity would involve use of NB Power fording sites.

Vehicular traffic along the right-of-way may result in some rutting and related terrain disturbance. This can result in the concentration of runoff and can cause longer term erosion. The impacts of this activity could result in minor impacts on some streams. Given standard operating procedures normally implemented by NB Power and those outlined in the watercourse alteration permits, the impact of operation on water quality is rated negligible. Access to previously inaccessible areas by secondary users as afforded by the proposed right-of-way will result in additional vehicular traffic. Some of this will not be along NB Power access routes and may result in greater impacts. These impacts would, however, be negligible.

Overall, the impact on water quality due to operations is rated negligible.

6.4.7 Summary

The impacts of operation and maintenance on various Valued Ecosystem Components are summarized in Figure 6-3.

6.5 Impacts of Accidental Events

Accidental events which may occur during the clearing and construction, and operation and maintenance phases of the project include:

- crashes of surveillance aircraft;
- fuel and lubricant losses;
- herbicide losses or mis-application; and
- forest fires.

Concerns of aircraft crashes are:

- direct mortality of species through impact or from toxic smoke;
- release of fuel into the local environment; and
- increased risk of forest fire.

Fuel, lubricant and herbicide releases are not expected to be a common occurrence, but there is concern that those and related accidental events will have localized effects on vegetation, air and water quality.

Activities during the clearing and construction phase, especially, but also during the operation and maintenance phase, will increase the likelihood of forest fires; specific concerns include:

- human presence, specifically smoking, vehicles and construction camp facilities; and
- surveillance aircraft crashes.

Use of the right-of-way for uses other than by NB Power increases the potential of forest fires, in particular. However, the right-of-way will provide improved access for fire fighting, and may act as a fire break. This would tend to balance the increased risks.

The following sections address the potential impacts of accidental events where applicable to Valued Ecosystem Components.

6.5.1 Mammals

6.5.1.1 White-tailed Deer

An abundance of browse and adequate winter shelter are necessary for supporting white-tailed deer. The vegetation following a fire would provide excellent browse, but without adequate winter shelter, the area would become poor range. The long-term implications of such an event could result in minor negative impacts on the area affected, depending on the size of the fire. Small, localized burns would have beneficial effects for deer.

6.5.1.2 Moose

Significant benefits will occur for moose in the event of an extensive forest fire. A recent fire in the Acadian peninsula has enhanced moose habitat (WMS 1990a), since moose prefer young successional stands such as those created by fires. In areas of moderate winter severity, shelter is not an absolute requirement. Overall, any forest fire could result in minor positive impacts.

6.5.1.3 Marten

Marten would be the species most at risk in the event of a forest fire. Marten prefer mature, coniferous forest with small openings, inferring that some benefit would occur from small, localized fires. However, an extensive fire would have major adverse impacts in that portion of the marten range crossed by the proposed route which contains prime habitat. The impact of forest fires is thus rated minor negative.

6.5.2 Birds

6.5.2.1 Upland Game Birds

The role of fire in the ecology of upland game birds is important, especially for ruffed grouse, which requires early successional stages of aspen as forage. Beneficial impacts are expected for upland game birds if fire occurs, provided it is not extensive; nesting cover is similarly important. Overall, however, the impact of forest fire on upland game birds is rated minor negative because of the possibility of extensive burns and the loss of nesting cover.

6.5.3 Fish

6.5.3.1 Atlantic Salmon and Brook Trout

Potential Interactions

Fuel and lubricant spills into streams could cause effects on fish and fish habitat. Forest fires could also affect fish habitat.

Issues and Concerns

The release of fuel and lubricants may result in direct mortality to fish or their food supply. Forest fires could result in serious water quality impacts which could affect fish and the loss of stream bank vegetation cover would affect habitat quality.

Existing Knowledge

Most components of fuel used in transmission line construction and operation are highly volatile, and lighter than water. The quantities of fuel normally transported along transmission lines is small (normally 225 litre drums). The likelihood of a major spill is also small. Hydrocarbons can be lethal to fish or taint their flesh at low levels of toxicity.

Following a forest fire, organic materials can be washed into streams, affecting fish habitat quality (Lotspeich, et al. 1970). Significant short-term increases in chemical oxygen demand occur due to the increased amounts of nutrients, particularly organic potassium. If the siltation is serious enough, fish will be displaced, eggs suffocated, and spawning sites will be damaged. If the fire is localized, fish are thought to move downstream or upstream to avoid increased temperatures, due to the loss of vegetation shading.

Potential Impacts

The likelihood of a major fuel spill associated with line construction and maintenance is small. Minor spills (<225 litres) would be expected to result in negligible, short-term impacts.

It is difficult to predict impacts on fish populations since many factors are influencing the pattern of forest fires. Impacts on a particular fish population in a river could be serious enough to affect it for several generations if enough of the breeding stock or yearly cohort are killed. Since Atlantic salmon and brook trout exhibit high fidelity to their natal streams, many generations could pass before stocks are replaced. The revegetation of an area will determine the duration of impact. Potentially, major impacts on Atlantic salmon and brook trout could occur in the case of a major forest fire. However, the likelihood of such impacts being attributable to the proposed transmission line is extremely low. Thus, the impact is rated as minor.

Overall, the impact due to accidental events is rated as minor negative.

6.5.4 Rare, Threatened and Endangered Species

The likelihood of a major forest fire occurring as a result of the proposed transmission line and the possibility of it affecting cougar, lynx, bald eagle and osprey is limited. For all of these species, the impact of accidental events is rated negligible negative.

6.5.5 Air Quality

Smoke from forest fires would cause short-term impacts on local air quality. The overall impact of these events is rated negligible.

6.5.6 Water Quality

The accidental release of hydrocarbons would probably result in short-term impacts which are rated as negligible negative.

Silt and ash and related impacts from forest fires could cause short-term impacts on water quality. These are rated as minor negative.

Overall, the impact of accidental events on water quality is rated minor negative.

6.5.7 Summary

The impacts of accidental events on various Valued Ecosystem Components are summarized in Figure 6-4.

6.6 Cumulative Impacts

It is now widely recognized that the full impact of a project or development on the environment may not be reflected by the individual interactions of project components or activities with valued environmental components. The combined effect of all project interactions may be more significant than individual interactions and, as well, aspects of the project may interact with other human influences in an area in a cumulative way. Peterson, et al. (1987), in discussing the major cumulative effects issues facing Canadians, defined cumulative impacts as those that:

- occur so frequently in time or so densely in space that they cannot be "assimilated"; or
- combine with effects of other activities in a synergistic manner.

6.6.1 Biophysical Cumulative Impacts

In discussing cumulative effects it becomes less meaningful to distinguish between effects that are biophysical or socioeconomic in nature. Indeed many of the cumulative effects that are often recognized are a product of both biophysical and socioeconomic influences. For example, in northeastern New Brunswick habitat suitability for white-tailed deer has been significantly altered through the loss of essential winter cover as result of forest fires (a naturally occurring event) and as a result of timber harvesting and road construction (human influences) (WMS 1990a). It is more helpful to consider the cumulative impacts of all influences, whether natural or human-induced in nature, on each of the Valued Ecosystem Components.

In assessing the impact of the proposed transmission line on the environment of the right-of-way, it is important to consider both the potential for cumulative impacts and the significance of the incremental increase in effect caused by the project or a particular activity. That is to say, although an effect resulting from a particular interaction may be cumulative, it may not be significant from a population standpoint.

Although the major types of cumulative effects that are of widespread public concern, such as those related to acidification, climatic modification, habitat fragmentation or soil degradation, are understood in general terms, cumulative effects are extremely difficult to measure at the population level. Scientists often have a poor understanding of the role of natural processes in the regulation of plant or animal populations. It becomes virtually impossible in these cases to accurately evaluate the capacity of the population to adjust to external influences. We also lack the understanding required to assess the likelihood of synergism among effects and the potential for the combined effect of a number of minor impacts to exert a controlling influence on a population. It is at least theoretically possible that the cumulative effect of a number of minor impacts could significantly affect a population over several generations.

With these limitations in our ability to meaningfully assess cumulative impacts in mind, an effort has been made to identify the potential for the phases of the proposed transmission line to have a cumulative impact on Valued Ecosystem Components. The risk of cumulative impacts was subjectively evaluated in light of the current knowledge of the status of populations along the proposed route and the factors that might be limiting these populations. Only those Valued Ecosystem Components which rated minor negative have been assessed in the following sections; those rated negligible or minor positive are not considered to contribute to cumulative negative impacts.

6.6.1.1 White-tailed Deer

White-tailed deer are common along the proposed route, however, DNRE personnel feel that deer populations have been declining for several years. A number of natural and human-related factors are having a pronounced influence on the status of this species.

Winter weather conditions represent a major limiting factor, since this species is approaching the northern limit of its range and snow depths in interior New Brunswick, which greatly restricts mobility and availability of food. Severe winters during the late 1960s and early 1970s resulted in widespread mortality and an abrupt population decline.

Although the role of predation in regulation of white-tailed deer populations in New Brunswick has not been well-documented, predation is presently considered a significant limiting factor, particularly predation by coyotes in some deer wintering areas. Other limiting factors include:

- high levels of resource harvesting (both legal and illegal);
- collisions with vehicles along major arterials; and
- intensive logging practices which have reduced the availability of critical winter cover.

Together, there is a strong likelihood that these factors are limiting deer numbers along the proposed route. Consequently, there is potential for the establishment of the proposed right-of-way to contribute to the cumulative impact on this species. Disturbance during sensitive periods is the main concern associated with construction and operation. Apart from the remote possibility of accidental events, habitat losses resulting from right-of-way clearing and line construction are small in relation to other disturbances such as timber harvesting. In relation to other human-related impacts, construction and operation are not expected to contribute a measurable amount to the cumulative impact on this species.

6.6.1.2 Moose

The overall impacts of the proposed route are not expected to contribute measurably to the cumulative impacts on moose.

6.6.1.3 Marten

Of the terrestrial furbearers under consideration in this impact assessment, marten appear to be the most at risk due to their requirement for mature forests and possible sensitivity during the natal denning period. Predicted cumulative impacts reflect the abundance of marten along the proposed route and/or the amount of suitable habitat at risk.

Construction and operation of the proposed route are not expected to contribute measurably to the cumulative impacts on marten. Accidental events resulting in loss of critical habitat are expected to have a minor effect on the cumulative impacts on marten populations.

The demand by the forest industry is expected to have the greatest impact on marten populations. Forest fires or past logging activities have reduced the amount of suitable stands in some areas. Trapping and other natural mortality factors are also affecting population densities at present.

6.6.1.4 Waterfowl

The overall impacts of the proposed route are not expected to contribute measurably to the cumulative impacts on waterfowl.

6.6.1.5 Upland Game Birds

Construction and operation of the proposed route is not expected to contribute measurably to the cumulative impacts on upland game birds. Grouse exhibit strong habitat preferences and thus impacts of the proposed route will have minor consequences for the population if habitat is lost due to a forest fire started as the result of an accidental event.

6.6.1.6 Atlantic Salmon and Brook Trout

Since populations of Atlantic salmon and brook trout are often restricted to a single river, localized impacts can have more severe consequences. Unless properly mitigated, accidental events such as hydrocarbon spills could damage important habitat and cause disturbances during spawning. However, existing conditions will probably have a greater influence on the cumulative impact on salmon and trout populations. These conditions include:

- off-shore commercial fishing (Atlantic salmon);
- recreational fishing;
- illegal fishing;
- siltation from logging and recreational vehicles in or near critical habitat;
- barriers to migrating fish;
- acidic precipitation; and
- other sources of pollution.

The predicted cumulative impact of accidental events and existing conditions is minor along the proposed route. Normal construction and operation activities are not expected to contribute measurably to the cumulative impacts on Atlantic salmon and brook trout.

6.6.1.7 Endangered Species

The overall impacts of the proposed activities are not expected to contribute measurably to the cumulative impacts on the endangered species considered in this EIA study, i.e, cougar, lynx, bald eagle and osprey.

6.6.1.8 Air Quality

The impacts of ozone from the operation of the proposed transmission line are not expected to contribute measurably to the cumulative impacts on air quality.

6.6.1.9 Water Quality

The contribution of accidental events such as hydrocarbon spills would have a minor but transient impact on the cumulative effects on water quality. Possible siltation and contaminant waste associated with the construction and operation of the transmission line would be insignificant compared to the contribution from other sources. These sources include:

- acidic precipitation and other air-borne pollutants;
- silt caused by logging and recreational vehicles in or near streams; and
- untreated sewage entering the watercourse.

CHAPTER SEVEN

SOCIOECONOMIC IMPACT ASSESSMENT

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7.0 SOCIOECONOMIC IMPACT ASSESSMENT

7.1 Basis for Socioeconomic Impact Assessment

Following the study strategy, the socioeconomic impact assessment will focus on the evaluation of potential interactions between the various project activities and Valued Socioeconomic Components. To ensure that potential impacts are evaluated on a comparable basis for the proposed transmission line, the evaluation process will be standardized to parallel that described in Section 6.1. In addition to predicting the magnitude of potential impacts, the evaluation will employ a numerical rating system similar to that employed for biophysical impacts, to indicate the magnitude, duration, geographical extent and probable frequency of occurrence of expected interactions.

The socioeconomic impact assessment will be organized by project component or activity. To facilitate a comparative evaluation of levels of impact along the proposed route, summary matrices will be presented for each project activity indicating the impact ratings for each Valued Socioeconomic Component. The impact assessment will generally follow the same format as for Valued Ecosystem Components (Section 6.1).

7.2 Evaluation of Socioeconomic Impact Significance

Despite several attempts to articulate a framework for evaluating socioeconomic impacts, there has been little consensus to date. Thus, in order to preserve consistency within this EIA, impacts on Valued Socioeconomic Components will be ranked using four criteria, similar to those used to evaluate impacts on Valued Ecosystem Components and as developed by WMS (1990a) (Section 6.2).

These criteria are defined on the basis of measures of significance developed in various sources in the literature, including Duncan and Jones (1976) and FEARO (1978) and as developed for biophysical impact assessment in Chapter Nine. Where reference is made to a population, this will include the activities habitual to the group including economic, social and recreational activities. The four criteria are as follows:

- a **major** impact is defined as either one of long duration (lasting several generations) or one affecting an entire definable group of people in significant magnitude to cause a significant change in economic, physical or psychosocial well-being or in long established activity patterns that would not return to pre-project levels or patterns within several generations;

- a **moderate** impact is defined either as one which is of medium-term duration (one which affects one or two generations and/or the portion of the population dependent upon it) or one which affects a moderate portion of the population without affecting the integrity of the population as a whole;

- a **minor** impact is defined as either one of short-term duration or affecting a specific group of people in a localized area but not necessarily affecting the integrity of the entire group itself; and

- a **negligible** impact is one of either very short duration or one which affects a small group of people or which occurs in a localized area in a manner similar to small random changes due to extraneous irregularities, but having no measurable effect on the population as a whole.

The system used to rate socioeconomic impacts is illustrated in Figure 7-1.

7.3 Impacts Of Construction Activities

7.3.1 Recreational Land Use

The line may interfere with certain recreational opportunities while enhancing others during construction. Construction activities may temporarily interfere with aesthetics at stream crossings and may briefly interfere with the angling opportunities at watercourse crossings. This interference will result in short-term, transient impacts.

The precise frequency and location of primary recreation activity is not well documented, however discussions and user surveys indicate that activity is concentrated on rivers, the immediate shoreline of water bodies and along roads and trails. Construction activity will be focused on the existing road and trail network, and along the right-of-way.

The right-of-way may provide increased access for recreational pursuits such as hunting, trapping or fishing. However, given the extensive network of logging roads on or adjacent to the proposed route, the net effect of increased access may be limited. The same can be said for cross-country skiing, hiking or snowmobiling opportunities. For the most part, these activities are not currently conducted in locations where the proposed transmission line is to be located, with the exception of roads, trails and river crossings. Although the potential exists, such effects are difficult to quantify.

7.3.1.1 Sport Fishing

Potential Interactions

The general conclusion is that anglers are likely to experience construction noise, and to a lesser extent, visible intrusion of construction personnel and equipment. Anglers may be present when construction personnel are working in the vicinity of watercourses.

Issues and Concerns

Construction noise and visibility may be an annoyance and reduce the quality of the experience of sports fishermen. In addition, reduction in the quality of the experience available along the proposed route may cause shifts to alternative areas, depending on the availability of the resource that is harvested in adjacent areas.

Possible habitat degradation due to siltation and loss of streambank cover is of concern in the long term to sport fishing due to potential impact on the fish stock (Section 6.3.3). The proposed route crosses watercourses that are not only important angling waters, but also are important spawning and rearing habitat. Specific areas of concern include those watercourses described in Section 5.1.1.1.

Existing Knowledge

Information related to sport fishing activity is provided in Sections B.2.2.1 and 5.1.1.1. The fishing season for most species angled in the area generally spans the April to September period with the exception of the Atlantic salmon period for the Bartibog River which extends to October 15 and for the Tabusintac River to October 26. Construction is expected to occur in the spring, summer and autumn.

Considering the slight amount of land included in a right-of-way (50 m), alternative locations within the study corridor which are within reasonable driving distances from the users place of residence should be readily available.

As noted in Chapter Two, Project Description, once the route has been surveyed, construction will occur in stages, with a clearing crew advancing along the proposed route ahead of the actual tower construction and stringing crews.

However, NB Power will also obtain a watercourse alteration permit as required under the **Watercourse Alteration Regulation - Clean Water Act**, for all watercourses which are to be crossed. This should minimize potential impacts.

Impact Prediction

Construction will occur during peak seasons of angling activities. As clearing and construction crews will advance in stages, not all sections of the proposed route will be affected during the same season/period. Construction will normally be conducted during weekdays. Weekend work and night work will be less frequent, and this will result in less interaction.

The major potential construction impacts on angling activities will be the possibility of habitat degradation of species important to anglers and increased resource harvesting pressures on adjacent areas as anglers temporarily shift to other areas to avoid construction activities. Similarly, increased access to previously inaccessible areas for angling may result in increased pressure on fish stocks along the proposed route. In consideration of the short period and transient construction activity over any one of the watercourses to be crossed and the potential small number of anglers who would be angling any one particular stretch of a river, the use of alternative areas should not readily create increased resource harvesting pressure in alternative areas. The impact is predicted to be negligible.

Watercourse crossings during construction require a watercourse alteration permit which requires proponents and their construction crews to implement environmentally acceptable construction practices. These are reflected in the measures outlined in the Generic EPP (Section 8.1.3). If NB Power follows similar work practices pursued in the past, there should be a negligible impact on habitat (E. Legacé, pers. comm.). The Regional Wildlife Biologists and District Rangers consulted believe there would negligible impacts on habitat degradation, as long as NB Power follows the watercourse alteration permit requirements along the entire length of the proposed route (A. Madden; J. Mundle; A. Goddard; R. Babin; J. Furlotte; E. Legacé; pers. comm.). Based on this past experience with NB Power construction procedures, the impact of watercourse crossing on angling due to habitat degradation is predicted to be negligible. The overall impact of construction activity on sport fishing is rated as negligible negative.

Increased access to previously inaccessible areas is not anticipated to be a serious problem as access to watercourses is currently well developed due to forestry, mining and other resource road networks. In fact, the opening up of new areas to angling can be viewed as a potentially positive impact provided it does not result in excessive pressure on stocks. This is not likely to be a serious factor overall; access is widely available to most stocks and new access would only redistribute angling efforts.

7.3.1.2 Hunting

Potential Interactions

Construction of the transmission line right-of-way could interact with hunting activities. Hunters may experience construction noise, and to a lesser extent, visible intrusion of construction personnel and equipment. Hunters may be present when NB Power equipment and personnel are building the transmission line.

Issues and Concerns

Construction noise and visibility may be an annoyance and reduce the quality of the experience of hunters. As noted for fishing in Section 7.3.1.1, construction activity may be of sufficient annoyance to cause a temporary shift to alternative hunting areas.

Existing Knowledge

Information related to hunting activity is provided in Sections B.2.2.1 and 5.1.1.2. The hunting season varies by species, but generally spans the September to November period, except bear, which is also hunted in the spring during April to June. Construction is expected to occur in the spring, summer and autumn.

As noted in Section 7.3.1.1, construction will progress along the right-of-way in stages.

Impact Prediction

Construction noise will be audible over a small area but may affect the quality of the hunting experience. Game may also be startled and avoid areas where the construction is occurring. Due to the transient nature of construction, these impacts will be negligible along the entire proposed route. At worst, these impacts could create annoyance and cause temporary shifts to alternative locations in alternative areas. However, as the right-of-way is so small in relation to other alternative locations within the study corridor and the Province as a whole, the number of hunters using this area or an area in proximity to construction activity is small (especially in the poorer hunting areas north of Newcastle), any such shifts should have negligible impacts on hunting pressure and harvest success along the entire length of the proposed route. Because of the potential small number of hunters affected and the short duration of construction activity within any one kilometre, the overall impact on hunting is negligible.

7.3.1.3 Snowmobiling

As the actual construction of the transmission line would not occur during the winter months, construction activities would have no direct impact on snowmobiling activities. The proposed transmission line route may be used as a trail for snowmobiling. The impact is rated as minor positive.

7.3.1.4 Cross-country Skiing

As the actual construction of the transmission line would not occur during the winter months, construction activities would have no direct impact on cross-country skiing activities.

7.3.1.5 Canoeing

The potential interactions, issues and concerns, and potential impacts for canoeing activities are similar to those for sport fishing, discussed in Section 7.3.1.1. Basically, the only interactions are at watercourse crossings where the effects of increased siltation in the stream may affect the aesthetic value of the canoeing activities. The impact on canoeing is therefore rated as negligible for all portions of the proposed route.

7.3.1.6 Camping

As noted in Section 5.1.1.6, the proposed route does not pass within one kilometre of any campgrounds except The Enclosure Provincial Park. Ambient noise levels at the Park often include noise from logging activities which would be comparable to the noise from construction activity. As campers in this park may possibly hear the construction activity, the impact on campgrounds along the Salisbury to Newcastle portion of the proposed route is negligible. There is no impact on the remaining portions of the proposed route.

The only impact for campsite leases would occur along the Newcastle to Bathurst portion of the proposed route where campsite leases are within one or two kilometres of the proposed route. However, as the proposed route follows an established transmission line in this section, there will be no new access by other recreationalists to these campsites. As these lessees may hear the heavy equipment used to construct the line, and since this activity is of a transient nature, the noise from the transmission line will have a negligible impact on these lessees in this portion of the proposed route.

The overall impact of the construction of the transmission line along the proposed route will be negligible in the Salisbury to Bathurst portion of the transmission line. As there are no camps or campsite leases within or near the proposed route in Bathurst to Belledune, consideration of impacts is not applicable.

7.3.2 Commercial Land Use

7.3.2.1 Forestry

Potential Interactions

Construction of the proposed transmission line will remove an area of forest land from production similar in area to the area of the right-of-way, with the resultant loss of present and future income to the Crown Timber Licensees and private land holders.

The proposed route was drawn to avoid most operations along the corridor such as leased sugar bushes and silvicultural operations and no interaction is anticipated. Two permanent sample plots (PSPs) will be cut (Section 5.2.1).

Issues and Concerns

In the case of forested land, the requirement to control the vegetation on the right-of-way at a height which will not interfere with line-to-ground clearance will effectively preclude the use of these areas for pulp or timber production.

Existing Knowledge

An estimated 106,354 m^3 of standing timber of all species from both Crown and private lands makes up the right-of-way of the proposed route (Table 7-1); this is the volume of wood remaining after the removal from the analysis of non-forest area such as residential areas, agricultural and wetlands. About 1,250 ha will be permanently taken out of wood production (Table 7-1); this includes silvicultural operations as well as standing timber. The methodology used to arrive at the figures in this section was described in Section 5.2.1.

This estimated volume of wood products lost from the Crown and private lands (106,354 m^3) (Table 7-1) along the proposed route is small compared to the total volume of wood production on Crown land in the Province, and amounts to two percent of the 1988/1989 total of 5,234,013 m^3 (DNRE 1989). The current estimated value of this volume of wood lost is $930,778 (Table 7-1). The actual dollar value which would be paid by NB Power will not be determined until the wood is actually cut and scaled. No attempt has been made to estimate the future volume and value of the wood gained if the right-of-way were not cut. Estimation of this future loss of wood to the forest industry would be difficult. NB Power normally pays "one-time-only" stumpage rates on a cord-by-cord basis (NB Power, pers. comm.). Thereafter, the right-of-way is kept cleared.

Impact Prediction

Based on the estimated cutting of two percent of the annual Provincial harvest, the overall impact of construction on the forest industry is expected to be minor and negative as Licensees will have to allow for this volume of wood in their plans. This quantity of wood is spread out evenly along the route and across several Timber Licences. The impact of these volumes in the pulp and paper industry is thus negligible and can be managed.

Two PSPs lie on the proposed right-of-way (Section 5.2.2) The impact on these PSPs is negligible as DNRE can move the location of the plot anywhere within the stand without

TABLE 7-1: ESTIMATED VOLUME AND VALUE OF WOOD LOST TO RIGHT-OF-WAY IN CROWN TIMBER LICENCES, BASED ON CURRENT MARKET VALUE

Wood Class	Volume	------ Current Values ($) ------		
Licences 6 & 7	(m³)	Sawlogs	Pulpwood	Total
SOFTWOOD	23,871	126,517	112,194	238,711
HARDWOOD	3,652	3,871	18,242	22,113
MIXED - SOFTWOOD DOMINANT				
Softwood @ 70%	2,586	13,707	12,155	25,862
Hardwood @ 30%	1,108	1,175	5,536	6,711
Total	3,695			
MIXED - HARDWOOD DOMINANT				
Hardwood @ 70%	2,844	3,015	14,206	17,221
Softwood @ 30%	1,219	6,460	5,729	12,189
Total	4,063			
SUBTOTAL	35,281	154,745	168,063	322,807
Licences 3 & 4				
SOFTWOOD	16,789	88,984	78,910	167,894
HARDWOOD	5,480	5,809	27,375	33,184
MIXED - SOFTWOOD DOMINANT				
Softwood @ 70%	3,182	16,863	14,954	31,817
Hardwood @ 30%	1,364	1,445	6,811	8,256
Total	4,545			
MIXED - HARDWOOD DOMINANT				
Hardwood @ 70%	3,697	3,919	18,469	22,388
Softwood @ 30%	1,585	8,399	7,448	15,846
Total	5,282			
SUBTOTAL	32,097	125,419	153,967	279,386
Licences 1 & 2				
SOFTWOOD	19,490	103,297	91,603	194,900
HARDWOOD	12,488	13,237	62,376	75,613
MIXED - SOFTWOOD DOMINANT				
Softwood @ 70%	3,289	17,433	15,460	32,893
Hardwood @ 30%	1,491	1,494	7,041	8,536
Total	4,699			

TABLE 7-1: ESTIMATED VOLUME AND VALUE OF WOOD LOST TO RIGHT-OF-WAY IN CROWN TIMBER LICENCES, BASED ON CURRENT MARKET VALUE (CONTINUED)

Wood Class Licences 6 & 7	**Volume (m^3)**	**------ Current Values ($) ------ Sawlogs**	**Pulpwood**	**Total**
MIXED - HARDWOOD DOMINANT				
Hardwood @ 70%	1,610	1,706	8,040	9,746
Softwood @ 30%	690	3,656	3,242	6,898
Total	2,299			
SUBTOTAL	38,976	140,823	187,776	328,585
TOTAL	106,354	420,987	509,791	930,778

SOURCE: DNRE (1989)

affecting the information gained, as these stands are sufficiently large to do this, and because the proposed right-of-way does not bisect the stands (M. MacDonald, pers. comm.).

Overall the impact of construction on forest harvesting is minor for all portions of the proposed route.

7.3.2.2 Agriculture

Potential Interaction

Construction of the proposed transmission line could possibly interact with some agricultural activities such as planting, critical or sensitive birthing periods, and harvesting. Construction equipment may affect soil structure and density and may result in erosion. Crops may be damaged by vehicular traffic. This interaction is limited to the Salisbury to Newcastle portion of the proposed route.

Issues and Concerns

The construction of the transmission line could result in the interference of farming activities such as planting and harvesting of crops. Construction could impact crops depending on specific growth stage.

Another concern is weed or insect contamination from construction machinery. While there may not be many agricultural farms along the transmission line, there is still the possibility of transmission of disease organisms and insects such as the gypsy moth or obnoxious weeds. This possibility increases with machinery which has been used in many locations (J. MacMillan, pers. comm.).

Potential traffic across fields is also of concern. Machinery used could damage tile drainage and surface drainage ditches and rutting caused by heavy machinery can cause soil compaction or erosion (H. Rees, pers. comm.). This is dependent on the time of year in which construction is commenced.

Existing Knowledge

The proposed route, between Salisbury and Newcastle, passes through extensive areas of private land with small areas of agricultural activity. The route also crosses a brussel sprout crop in the Rogersville area. There are no agricultural activities located along the proposed route between Newcastle and Bathurst.

With respect to agriculture, construction activity through fields would likely be limited to an area required for access. This area, together with an area for any tower sites (approximately 100 m^2), will be disturbed during construction.

In order to alleviate such problems as interference and machinery movement, it has been the practice for a representative from NB Power to discuss the project with landowners along a transmission line, at which time potential conflicts are addressed, and where possible, remedied (NB Power, pers. comm.). Specifically, interference with spring planting can be minimized by scheduling the work. Construction can be limited to dry periods to avoid erosion or soil loss, damage to soil structure and density, or the direct loss of crops. Care can be taken to ensure that vehicular traffic does not occur indiscriminately between fields to avoid the inadvertent transmission of pests and disease. When warranted, NB Power has and will compensate farmers for losses (NB Power, pers. comm.)

Impact Prediction

NB Power schedules construction activity, specifically where crops are located, for late spring and during the summer. This minimizes agriculture disruptions.

In addition, a small amount of agricultural land is affected with respect to the total area available for agricultural activities within the Province. Considering the small land area potentially affected, that the construction will occur over two seasons only (clearing and actual construction) and that the normal practice is to offer compensation for any losses associated with construction activity, the overall impact is rated as negligible.

7.3.2.3 Trapping

Potential Interactions

Construction of the transmission line right-of-way could interact with trapping activities. The trapping season occurs primarily during the October to December period, except for snowshoe hare and muskrat, which are harvested (in addition to the main season) in January/February and April/May respectively. Construction is expected to occur in the spring, summer and autumn and will be transient along the route. The interaction with a specific trapper or area would be expected to be of very short duration.

Issues and Concerns

Construction noise and visibility may be an annoyance and reduce the quality of the experience for trappers. As noted in Section 7.3.1.1 for angling, this could result in a temporary shift of trapping lines to alternative areas.

Existing Knowledge

Trapping activity and species harvested is provided in Section 5.1.2.3. As noted in Chapter Two, Project Description, construction will occur in stages.

Impact Prediction

Construction noise will be audible over a small area and may affect the quality of the experience for trappers and may startle the furbearers which are being harvested. Most trapping will be done outside of the construction season and there will no interaction. Where this is interaction, the transient nature, short duration, and limited extent of construction activity should not affect trapping activity significantly. Overall, the impact is rated as negligible.

7.3.2.4 Mining and Mineral Resources

Bedrock Quarries

As the proposed route crosses no bedrock quarries, there will be no impacts due to construction along the entire length of the proposed route.

Granular Aggregates

The proposed route passes through:

- two undeveloped deposits in the Salisbury to Newcastle portion;
- one small undeveloped deposit in the Newcastle to Bathurst portion; and

- two active quarries and three undeveloped sites in the Bathurst to Belledune portion.

Due to the minimal potential of the undeveloped sites (P. O'Leary, pers. comm.) in the Salisbury to Bathurst portions of the proposed route, there will be no impacts of construction for these portions. However, the two active sand/gravel pits in the Bathurst to Belledune portion of the proposed route will lose the section of land on which towers will be built, as mining near the towers could result in the towers toppling over. Because of the extensive area covered by sand and gravel deposits in this area of the Province and the small area used by the towers in comparison to the total area available, the amount of aggregate lost through restriction of mining is rated as negligible in the Bathurst to Belledune portion of the proposed route.

Peat Extraction

As noted in Section 5.1.2.4, three commercial bogs with development potential and which the proposed route will pass, are located within the Salisbury to Newcastle portion of the proposed route. However, although undeveloped, the heavy and tracked equipment used during the construction could disturb the boggy terrain. Considering that the bogs are currently undeveloped and that these bogs are small relative to the number of bogs in the Province, the impact on peat extraction is negligible.

The overall net impact on mining and mineral resources is negligible in the Newcastle to Salisbury and Bathurst to Belledune portions of the proposed route. There is no impact in the Newcastle to Bathurst portion of the proposed route.

7.3.2.5 Maple Sugar

As there are no operating and probably no potential maple sugar operations within or near the proposed route, consideration of impacts is not applicable.

7.3.2.6 Airports

As the proposed route is not situated near the restriction zones of any of the airports or airstrips in the area, except that of CFB Chatham, consideration of impacts is not applicable. The CFB Chatham restriction zone specifies no structures higher than 76.2 m above sea level. Since the proposed towers are below this height, consideration of impacts is not applicable.

7.3.2.7 Outfitting

Potential Interactions

Construction personnel may be clearing the proposed transmission line right-of-way or constructing the line when outfitter clientele are using the area for fishing or hunting.

Issues and Concerns

Concerns related to outfitting can be summarized as follows:

- a reduced quality of experience for clientele as a result of visibility of the construction of the transmission line, i.e., reduced aesthetics;
- a reduced quality of experience and harvest success for clientele if both construction personnel and hunters/anglers are in the right-of-way area at the same time;
- loss of potential revenue for outfitters who cannot temporarily shift their activities to other areas as clients suffer from reduced level of harvest success;
- reduction in the quality of the experience available in the proposed route area may cause shifts to alternative areas, depending on the availability of the resource that is harvested; and
- the construction crews and equipment could be considered a threat to the wildlife inhabiting the area.

Existing Knowledge

As noted in Chapter 5.2.1.7, two outfitters, the Salmon River Lodge and the Broken Feather Lodge currently use portions of the proposed route between Salisbury and Newcastle. Salmon River Lodge, based in Chipman, uses the Salmon River area within the proposed route from May to December. The clearing and construction activities could result in a loss of potential revenue to the Salmon River Lodge because operations cannot be temporarily relocated (J. Mills, pers. comm.). Broken Feather Lodge based in Red Bank occasionally uses the Northwest Miramichi River area within the proposed route from May to November. Broken Feather Lodge is able to temporarily shift operations elsewhere due to the infrequent use of the area and the availability of alternative hunting and fishing grounds (W. Ward, pers. comm.).

The quality of experience for outfitter clientele is directly related to the level of wilderness quality and is impacted by the level of use along the proposed route. The noise from the construction will be audible over a small area and may startle the game being harvested. Consequently, the presence of construction equipment and the occurrence of construction activity along the proposed route contributes to the decline of "quality of experience" for outfitter clientele.

As noted in Chapter Two, Project Description, the clearing for the proposed transmission line right-of-way in the Salisbury to Newcastle portion of the proposed route is scheduled for October to November 30, 1990 and construction is planned to commence March 1, 1991 and be completed November 30, 1991. Construction will occur in stages with the clearing crew advancing along the proposed route ahead of the actual construction crew. Once construction has been completed in an area, equipment and personnel will be moved to the next area. Construction activity in any one area of the proposed route is of short duration.

Impact Prediction

In consideration of the short construction period over any one of the watercourse/areas to be crossed and the potential small number of anglers/hunters who would be angling/hunting a particular stretch of a river/area, the use of alternative areas should not readily create increased resource harvesting pressure in alternative areas. The impact is predicted to be negligible.

The construction period for the Salmon River area of the proposed route should occur in the late spring and summer and therefore clients hunting should not be affected by construction activity. As the period of construction or clearing activity is of a short duration and because of the potential small number of hunters/anglers who may be affected, the overall impact rating is negligible.

As there are no outfitting camps or activity within or conducted on or near the proposed route, consideration of impacts for the Newcastle to Bathurst and Bathurst to Belledune portions is not applicable.

7.3.2.8 Fox Farms

Potential Interaction

Foxes on farms located in the vicinity of the proposed transmission line right-of-way will hear the construction equipment and personnel.

Issues and Concerns

There is a concern that unusual and irregular noise from on-road and off-road vehicles, as well as the construction crews at critical times of the year, will cause the foxes to abort or to kill their young. This may lower the breeding success rate.

Existing Knowledge

Discussions with a representative of the New Brunswick Department of Agriculture, Livestock Services Branch (B. Trenholme, pers. comm.) reveal that noise is very disturbing to foxes during breeding, late pregnancy, and whelping.

Breeding occurs from December until March although foxes are in heat for only three to four days per year. Startling noises during breeding time can lower the breeding success rate and there is no way to manipulate this breeding time. The gestation period of a fox is 52 days. The latter portion of this time and the first two weeks after whelping are considered critical. The gestation period typically lasts from late February until mid-May (B. Trenholme, pers. comm.).

Although the New Brunswick Department of Agriculture was unable to give a decibel rating for noise which would affect foxes, noise from a helicopter, aircraft, or heavy equipment can be sufficient to cause abortion or to cause the fox to kill her young. In fact any sudden or loud noise, or any activity with which the foxes are not accustomed can cause a panic and result in the same action by the vixen (B. Trenholme; V. Taylor; pers. comm.).

The exact number of young affected is dependent upon the stage of gestation and the advancement of whelping. The noise however does not cause mortality among the adult foxes. The indirect impacts of noise include a higher incidence of distress and anxiety. The losses due to sudden or loud noise which could include clearing or construction equipment may not be not confined to the year of the event. Proven breeders might not produce in succeeding years and might have to be sold as pelters. Although there is a paucity of published data on the effect of sudden or loud noises on foxes, this information is based on general information from personal experience and contact with fox producers in the Province (B. Trenholme, pers. comm.).

There are six fox farms in the area of the proposed route near Salisbury. Three of these farms are within one-half kilometre of the right-of-way as noted in Section 5.1.2.8.

As noted in Chapter Two, the clearing for the proposed transmission line right-of-way in the Salisbury to Newcastle portion of the proposed route is scheduled to occur from October, 1990 to the end of November and actual construction is scheduled from March 1, 1991 to November 30, 1991.

Impact Prediction

Noise levels from machinery could cause the abortion or killing of the young (by the mother) on fox farms in proximity to the proposed route. As there are no fox farms located within or near the Newcastle to Bathurst or Bathurst to Belledune portions of the proposed route, consideration of impacts is not applicable.

7.3.3 Communities

Potential Interactions

Construction activity on the proposed route will occur near residential properties located within incorporated municipalities or ribbon developments throughout the study corridor.

Issues and Concerns

Issues and concerns of communities with respect to transmission lines may be summarized as follows:

- future development opportunities for communities will not be able to occur in the land area used by the transmission line;
- the noise and annoyance of construction activity for private landowners; and

- increased traffic as a result of the construction of a transmission line could result in more vehicular accidents.

A positive issue related to the construction of the transmission line is the economic spin-offs which will occur within the local economy as a result of the development, i.e., local employment opportunities, board and lodging dollars, and the funds spent for equipment rental, the operation of the equipment (gas, diesel, oil, grease) and the maintenance of both off-road and on-the-road equipment.

Existing Knowledge

The preferred route passes through both uninhabited forest and rural areas, but also near the City of Bathurst, the Town of Newcastle and near the Villages of Salisbury and Rogersville. More detail is provided in Section 5.1.3.

The main economic activities in the rural sections of the study areas are the harvesting and transportation of forest products. The line construction activities closely resemble woodlot operations and involve the same type of equipment, i.e., chain saws, skidders, cranes and trucks. Levels of noise, dust and dirt, and traffic that are generated would be similar to those which occur with local forestry operations. The amount of equipment involved would likely be similar in comparison with the level of activity in the forest industry.

Each municipality, LSD, and planning commission within the proposed study corridor was contacted to obtain restrictions, zoning by-laws and concerns. This information is provided in Appendix F and was used to establish constraints and routing objectives in Appendix B. In addition, all of the municipalities and LSDs within the study corridor were invited to a local government information session and a series of seven public open houses were also held. Concerns expressed at these meetings were addressed and are summarized in Chapter Five (local government sessions) and Appendices F and G.

Impact Prediction

The information gained through information collection and public and local government information sessions was used during the Route Selection Study (Appendix B) so as to address the concerns of the communities with respect to future development and zoning by-laws. As a result, there are no concentrated population areas near the proposed route for the transmission line. Therefore, the impact of construction on communities will be minimized and is rated negligible.

Manpower and Economic Impacts

As noted in Chapter Two, NB Power will inject funds into the local economy through:

- offering temporary employment opportunities to local labour primarily during the construction phase (surveying, clearing and construction of the line;
- board and lodging of permanent NB Power employees not normally residing in the local area;
- purchase of fuel, oil and lubricants, parts and service for a fleet consisting of about 50 highway vehicles during the peak construction months and parts and service for a fleet of approximately 60 off-road vehicles; and
- the opportunity to supply the heavy equipment rental required during the peak construction period.

The estimated increase in labour income created for each portion of the proposed route and the estimated contribution to communities as a result of board and lodging, equipment rental, and the purchase of oil and lubricants is provided in Table 7-2. This Table indicates that the estimated amount injected in the local economy as a result of the construction of the proposed route will be approximately $2.6 to $3.2 million. This does not include indirect benefits or economic spin-off, valued at $1.5 to $1.8 million, which occur within the economy as a result of direct spending. These estimates have been based on NB Power past experience with transmission line construction and accurately reflect the economic impact on local areas within the proposed corridor. However, it must be emphasized that these figures are estimates only. The impact of employment and business benefits will be minor and positive.

Another indirect and positive impact of the construction of the transmission line will be the positive impact on the current high rates of unemployment in the area. As noted in Section B.2.1.3, Appendix B, the current unemployment rates in all three of the regions of the proposed route exceeds the Provincial rate.

TABLE 7-2: ECONOMIC IMPACTS ON COMMUNITIES[1] (1987$)

	DIRECT IMPACTS		INDIRECT IMPACTS		TOTAL IMPACTS	
SALISBURY TO NEWCASTLE	LOW	HIGH	LOW	HIGH	LOW	HIGH
LABOUR	1,249,200	1,467,144	718,290	843,608	1,967,490	2,310,751
BOARD AND LODGING	316,000	474,000	204,768	307,152	520,768	781,152
EQUIPMENT RENTAL/SUPPLIES	227,000	235,420	92,645	96,764	319,645	332,184
TOTAL[2]	1,792,200	2,176,564	1,015,703	1,247,524	2,807,903	3,424,087
NEWCASTLE TO BATHURST						
LABOUR	624,600	749,520	359,145	430,974	983,745	1,180,494
BOARD AND LODGING	152,000	228,000	98,496	147,744	250,496	375,744
EQUIPMENT RENTAL/SUPPLIES	113,500	117,710	46,323	48,382	159,823	166,092
TOTAL	890,100	1,095,230	503,873	627,100	1,394,064	1,722,330
BATHURST TO BELLDUNE[3]						

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[1] Figures are based on past experience of NB Power and are estimates only

[2] NB Power also purchases supplies locally (oil, gas, diesel, grease) for a fleet of approximately 50 on-road trucks and completes any required services (maintenance for these on-road trucks and for a fleet of approximately 60 off-road vehicles.

[3] Impacts cannot be quantified as construction is expected to occur too far into the future

The overall impacts on communities is minor but positive as the economic benefits far outweigh any of the negligible impacts associated with construction.

7.3.4 Land Status

7.3.4.1 Land Value

Potential Interactions

Sections of the proposed transmission line traverse or cross over private property and therefore interaction between land value and the transmission line is quite probable. The interaction is the physical presence of steel tower on both private or freehold property and on Crown land.

Issues and Concerns

The construction of the transmission line could temporarily lower land values of the affected private property and adjacent private properties. If either attempted to sell their properties during the construction of the line (clearing and actual construction), the value of the property could be decreased.

Existing Knowledge

Construction of the transmission line could affect land values, but there is a strong belief the majority of the effect is in the long term. In addition to this, once the towers are in place, they are perceived to be not particularly attractive to some, difficult to screen, and can be an extreme nuisance to some (Hawley 1981). In general, however, the existence of transmission lines is accepted by the general public as common place.

When a transmission line passes over a private property, the property is appraised the same as adjacent properties. But, if the property does not sell, it can be assumed that the construction of the transmission line did affect the land value and the subsequent price is dropped (D. Doucet, pers. comm.).

Private property owners within the study corridor and within New Brunswick generally are long-term residents and thus the probability that a residence will be for sale (especially in the rural areas) during the construction season is small (WMS 1990a).

The construction of the transmission line is scheduled over two seasons as noted in Chapter Two. In addition, most residential properties have been avoided in the selection of the proposed route as described in Section 5.3.1.

Impact Prediction

Due to the transient nature of the construction activities, the relatively small number of property owners who could potentially be affected, and the low probability of a private property within one-half kilometre of a transmission line being sold during this short construction period, the impact on land value is rated as negligible.

7.3.4.2 Land Rights

Potential Interactions

Private land owners and Licensees of Crown land cannot use the land during the period of construction activity.

Issues and Concerns

Land owners cannot use the land during the construction period.

Existing Knowledge

The rights of property owners are not affected by the transmission line with the exception that NB Power now has the right to access the right-of-way to construct and maintain the transmission line. The private property owner continues to own the land and may use the land for most activities provided it does not affect the transmission line. Section 2.5 provides further information on the land rights of owners. The types of agreements which may be used by NB Power are also provided in Appendix C.

NB Power, under the authority of the **Electric Power Act**, in exercising their mandate uses private land for transmission lines to carry electricity from generating stations to users. In doing so, as noted in Section 2.5, NB Power uses three types of agreements which address the issue of owner's rights. These agreements give NB Power the right to survey, option for easement, or to purchase the property when necessary.

This action is used infrequently and with extreme discretion (NB Power, pers. comm). The authority to expropriate, under the larger realm of providing electricity to the Province, is granted to NB Power again under the **Electric Power Act**. Thus, the interactions between land rights and the transmission is addressed on a legal basis. This also applies to the operation/maintenance and accidental events of transmission lines.

The construction of the transmission line is transient and is scheduled over two seasons as noted in Chapter Two.

Impact Prediction

Due to the transient nature of the construction season, the impact on land rights is rated negligible.

7.3.5 Communications

As potential communications impacts will occur after the line is constructed, consideration of impacts as a result of construction activity is not applicable. This is addressed in Section 7.4.6.

7.3.6 Historic and Archaeological Resources

Only one known site, CfDj-26, judged by the Archaeology Branch of the Department of Tourism, Recreation and Heritage to be of low cultural significance, is located close to the proposed route. This site, a prehistoric site known as the Poplar Grove site, is situated on the left of the Southwest Miramichi two kilometres from the junction with the Northwest Miramichi. This area is particularly rich in historic and prehistoric sites. The proposed route has been designed to avoid all known sites. The impact is rated negligible.

Following a review of archival literature and archaeological site information, it is considered possible that additional, previously undiscovered traces of prehistoric and historic human occupations will be found on or near major waterways, particularly the Petitcodiac, Southwest Miramichi, Northwest Miramichi, Nepisiguit and Tetagouche Rivers. Additional sites may also be encountered in the hinterland between the major waterways (A. Ferguson, pers. comm.). Therefore, the overall impact on this Valued Socioeconomic Component is minor.

7.3.7 Summary of Construction Activity Impacts

The impacts of construction on valued socioeconomic components are summarized in Figure 7-2.

7.4 Impacts of Operations/Maintenance

7.4.1 Recreational Land Use

Aesthetics and Recreation

As noted in Chapter Two, the proposed route has been located so as to avoid areas of particular aesthetic importance such as parks and important natural areas and vistas, where possible. As towers and the right-of-way will be visible in places, steps will be taken to minimize the aesthetic impact. These steps include avoiding "sky lighting" of the line, avoiding extensive distances along the length of heavily used valleys and the provision of greenbelts at places where the right-of-way meets roads or streams. The effectiveness of these greenbelts varies with topography and vegetation, however, the general guideline of 45 m used by NB Power in clearing, normally affords screening from adjacent roads. There are few areas where the line runs up steep hills from valleys although there are shallow valleys such as at the Miramichi River crossings where the line will be visible from both sides of the valley. There is no practical way to avoid such visibility particularly since the area is already cleared and highly developed with roads, bridges, residences, commercial establishments and the Miramichi Pulp and Paper mill.

Maintenance activities associated with the transmission line should have very little interaction with recreational users due to the limited frequency of the maintenance activities and the limited area of the transmission line right-of-way which is used by individuals and groups for recreational activities. Only portions of the transmission line right-of-way will be used for recreational activities and most of the use will be for access purposes. However, the existence of the transmission line may interfere with aesthetic aspects at watercourse crossings.

7.4.1.1 Sport Fishing

Potential Interactions

Once actual construction of the transmission line has been completed, NB Power will only use the right-of-way to complete scheduled maintenance and, in the event of an outage, conduct the necessary repairs. These activities should have little, except infrequent, interaction with anglers. The existence of the transmission line itself will provide increased access to some areas. Watercourse crossing activity will interact with fish and fish habitat.

Issues and Concerns

Maintenance of the right-of-way entails keeping the 50 m width clear of tall vegetation. This will provide access to angling areas which are not presently angled due to inaccessibility. As most of the newly opened up areas will probably be accessed by all-terrain vehicles (ATVs) (T. Pettigrew; A. Madden; B. Dubé; R. Babin, pers. comm.), damage to fish habitat could occur.

Maintenance activity may also be a temporary annoyance and reduce the quality of experience for anglers. This may cause temporary shifts to alternative areas.

Existing Knowledge

The proposed route crosses some major Atlantic salmon and brook trout rivers and/or their headwaters, as noted in Section 5.1.1.1. The effect of increased angling pressure on these areas is not known, but is believed that increased pressure in one area would only redistribute angling efforts; in the long-term pressures would "even out" based on supply of fish in the areas angled, i.e., initially increases pressure in the area but too many anglers reduces supply and therefore anglers shift to alternative locations. This is basically a matter of supply and demand (T. Pettigrew, pers. comm.).

Impact Prediction

The physical structure of the transmission line will have little impact on either the sports fishermen or the fish being angled along the entire length of the proposed route.

Increased access due to a new right-of-way is viewed by various Wildlife Biologists and District Rangers as having a positive, negligible or no impact on fishing activities. Increased access will have a positive impact on areas which are presently under-utilized, especially in the Salisbury to Newcastle section of the proposed route (T. Pettigrew; J. Mundle, pers. comm.). Increased access will have a negligible impact on areas which are already extensively angled, especially in the Bathurst to Belledune section of the proposed route (A. Madden, pers. comm.). However, there are few areas which are not already accessible (by canoe or access roads developed by forestry, mining or other resources) (J. Furlotte, pers. comm.). The net effect could be to displace current angling effort into the watercourses along the proposed right-of-way.

In consideration of the limited amount of time normally spent maintaining the transmission line over any one of the watercourses to be crossed and the potential small number of anglers who would be angling any one particular stretch of a river, the use of alternative areas should not readily create increased resource harvesting pressure in alternative areas. The impact is predicted to be negligible.

A negative impact of a new right-of-way could be an increase in accessibility for illegal harvesting. Increasing access could result in it being more difficult to enforce angling regulations/quotas along the entire length of the proposed route (B. Dubé, pers. comm.).

The overall net impact of operations is rated negligible positive for the Salisbury to Newcastle portion of the proposed route. The overall net impact of operations is rated negligible for the Newcastle to Belledune portions of the proposed route.

7.4.1.2 Hunting

Potential Interactions

Once actual construction of the transmission line has been completed, NB Power will only use the right-of-way to conduct scheduled maintenance and, in the event of an outage, conduct the necessary repairs. These activities should result in little interaction with hunters. The existence of the transmission line will not interact with hunters. Hunters will use the right-of-way for access.

Issues and Concerns

Maintenance of the right-of-way entails keeping the 50 m width clear of all vegetation. This will maintain an open area that will enable hunters to sight large game more easily, and will provide access to hunting areas, particularly those which are not currently harvested due to inaccessibility. Maintenance activity during the hunting season could cause game to avoid the vicinity of the work, affecting the success of hunters. Hunters may also be displaced by maintenance activities. Increased accessibility may be a positive impact for harvest success. However, increased access may also affect wildlife populations.

Existing Knowledge

Regional biologists believe that increased access as a result of the transmission line will not affect wildlife management plans for the area as most areas are accessible either by canoe, or by forestry or mining access roads (T. Pettigrew; B. Dubé; G. Godin; pers. comm.). Additional information on hunting activities is provided in Sections 7.3.1.2 and 5.1.1.2 and on NB Power maintenance activities is provided in Chapter Two.

Impact Prediction

The physical structures of the transmission line will have no impact on either the hunters or the game being hunted.

As noted in the section on sport fishing, an increase in illegal harvesting could result in a negligible impact along the entire length of the proposed route. Wildlife Management Zone 18, which is located in the southern section of the Salisbury to Newcastle portion of the proposed route, is presently closed to moose hunting. Therefore any increase in accessibility could increase illegal hunting in the area (T. Pettigrew, pers. comm.).

The impact of the proposed route on hunting activities range from negligible to negligible positive, depending on the existing hunting pressure on local moose and deer populations. In the Salisbury to Newcastle and Newcastle to Bathurst sections of the proposed route, specifically, along the Miramichi and in the Canaan Game Management Area, big game populations are plentiful, and better access is seen as a positive negligible impact (R. Currie; J. Mundle, pers. comm.). Rogersville is a popular area in moose season, with moose being extensively hunted and significant hunting pressure has resulted in a decrease in the local deer population (A. Goguen, pers. comm.). Construction of a new right-of-way could open up the area even more, placing greater pressure on local populations (A. Goguen, pers. comm.), and may increase exploitation of the present harvest levels (T. Pettigrew, pers. comm.). Overall, the net impact of operation on hunting in the Salisbury to Newcastle portion of the proposed route is negligible positive.

Although big game is plentiful in the southern portion of the Newcastle to Bathurst portion of the proposed route, specifically near the Miramichi, the northern portion of the proposed route currently experiences limited hunting (R. Currie; G. Godin; pers. comm.). In addition, the proposed route follows an existing transmission line and thus additional access to new hunting areas would not occur as the result of the new right-of-way. The impact on hunting in the Newcastle to Bathurst portion of the proposed route is negligible.

In the Bathurst to Belledune section of the proposed route, white-tailed deer populations in the northern portion of the Province (and study corridor) are also low, therefore an increase in hunting pressure could have a negligible impact on the local populations (A. Madden, pers. comm.). However, since populations are so low, hunting effort may prove to be too great for hunters to take advantage of the increased accessibility, thus the impact would be negligible.

7.4.1.3 Snowmobiling

As operations and maintenance activity will normally occur during the spring, summer and fall, maintenance activities would have no direct impact on snowmobiling activities. However, the clearing of the right-of-way will provide new open areas and may give different access points to the existing network of trails. This is dependent on whether the right-of-way is located close to existing clubs or existing trails. Given that existing transmission line right-of-ways are used for snowmobiling activity, the overall impact rating of the existence of the line on this recreational activity is minor but positive for all portions of the proposed route.

7.4.1.4 Cross-country Skiing

As the maintenance activity of the transmission line would not occur during the winter months, operation and maintenance activities would have no direct impact on cross-country skiing activities. However, the clearing of the right-of-way will create new open areas and thus a lack of shelter, in those areas where trails cross the proposed route. Although the extent and number of these crossings is not known, comparing the relative width of the right-of-way of 50 m to the length of the trail, which could be up to 30 km, the impact on cross-country skiing activities is rated negligible for the entire route.

7.4.1.5 Canoeing

Canoeing activities will also experience no impact due to operational activities as the only interactions with the transmission line is the right-of-way crossing a river. The frequency of such interaction would be extremely low as NB Power maintenance activities are of a short duration and are transient in nature.

7.4.1.6 Camping

As noted in Section 5.1.1.6, the proposed route does not pass within one kilometre of any campgrounds except The Enclosure Provincial Park. As campers in this park may possibly hear the heavy equipment used for maintenance activity but this activity is of such a short duration, the impact on campgrounds along the Salisbury to Newcastle portion of the proposed route is negligible. As there are no campgrounds in the remaining portions of the proposed route, the impact of operational activity is not applicable.

The only impact for campsite leases would occur along the Newcastle to Bathurst portion of the proposed route where campsite leases are within one or two kilometres of the proposed route. However, as the proposed route follows an established transmission line in this portion, there will be no new access by other recreationalists to these campsites. As lessees are accustomed to the heavy equipment used to maintain the existing transmission line, operational activities for the new transmission line should result in no further impact for these lessees.

The overall impact of the existence of the transmission line along the Salisbury to Newcastle portion of the proposed route is negligible. There is no impact for the Newcastle to Bathurst portion of the proposed route. As there are no campgrounds or campsite leases in the Bathurst to Belledune portion of the proposed route, the impact of operational activity is not applicable.

7.4.2 Commercial Land Use

7.4.2.1 Forestry

Potential Interactions

The proposed transmission line will interact with present and future forestry operations and any future Christmas tree plantations on the right-of-way. Production of pulp and timber will be precluded. Christmas tree plantations can be developed.

Issues and Concerns

The loss of 1,250 ha of productive forest land for production during the life of the project is of concern in view of predicted shortfalls in the study corridor area (WMS 1990a).

Operation and maintenance of the proposed transmission line could interfere with forest industry access to silvicultural operations, cutting blocks, and Christmas tree plantations. As well, operational activities could affect any future Christmas tree plantations in the right-of-way. The activities of recreationalists using the right-of-way could result in damage to Christmas tree plantations or provide access to previously inaccessible silvicultural areas.

Existing Knowledge

Access to forest industry operations will not be restricted by the existence of the proposed transmission line itself. Access roads can be built under the line, and towers can be avoided. Forestry operations can continue on either side of the proposed right-of-way; timber can be harvested up to the edge of the right-of-way. NB Power access routes to areas of the right-of-way containing Christmas tree plantations will be maintained by prior agreement with the lessee or operator. The control of recreationalists along the right-of-way is difficult to maintain as the public are not normally aware of the fact that NB Power easements may well be on private land.

The forest industry in New Brunswick is predicting shortfalls in the next 20 to 30 years (WMS 1990a). Productive forest land is critical to the development and maintenance of a sustainable supply.

Impact Prediction

Christmas tree plantation operators which have established operations under the transmission line will experience a positive minor impact because of increased opportunities provided by the establishment of the right-of-way. This may be offset partially by the impacts of the activities of recreationalists.

The loss of 1,250 ha of productive forest land for the life of the project will result in a potentially moderate impact.

The overall impact of operations on the forest industry is rated as moderate.

7.4.2.2 Agriculture

Potential Interactions

The existence of transmission lines across agricultural land creates potential interactions between maintenance and agricultural activity. This interaction is limited to the Salisbury to Newcastle portion of the proposed route.

Issues and Concerns

Use of the heavy equipment necessary to maintain and repair the transmission line and right-of-way are similar to those used to construct the transmission line. Therefore, the issues and concerns of operations activity are as noted in Section 7.3.2.2. In addition, the land occupied by the tower site is another issue as the tower site will permanently remove the land from future production. In addition, herbicides applied by NB Power to control secondary growth could damage or contaminate crops if it drifts to adjacent agricultural areas. Water sources could also be contaminated (J. MacMillan, pers. comm.).

For private landowners, and as noted in Section 7.3.2.3, ATVs could cause damage by tracking up the land where agricultural activities are conducted on the land within the right-of-way.

Existing Knowledge

Routine maintenance, of a non-emergency nature, is usually scheduled during times which minimize crop damage. However, if an outage should occur during planting periods, crews may cause damage to the crops. When warranted, NB Power has and will compensate farmers for losses (NB Power, pers. comm).

Herbicide practices are noted in Chapter Two. The herbicide being used could damage crops if it is allowed to drift to adjacent agricultural properties.

Impact Prediction

The impact of maintenance and operations of a transmission line on agricultural activities is subject to the time of year and type of maintenance. It is the normal practice of NB Power to schedule routine maintenance involving the use of machinery for non-planting times. However, should maintenance activity of an emergency nature be required and crop damage occurs as a result of this activity, NB Power has and will compensate for crop losses. The impact of transmission line maintenance activity is negligible.

In terms of the type of maintenance, the use of herbicides for vegetation control is applied when the terrain is rough or when other methods cannot be used. Normally, herbicides would thus not be used in agricultural areas which are generally accessible and gentle in slope. Regardless, if used, care can be taken to ensure that herbicide drifting does not occur between the right-of-way and adjacent agricultural areas. Considering the small number of agricultural operations in the vicinity of the proposed route with respect to total agricultural operations at the Provincial level, and NB Power's commitment to responsible application of these herbicides, the impact of herbicide application is rated as negligible.

As was the case for forestry and Christmas tree plantations, it may also be possible for landowners to establish agricultural operations (crops, gardens and blueberries) under the transmission line. These land owners will experience a positive negligible impact because of increased opportunities provided by the establishment of the right-of-way. This, however, would also be offset by the impacts of the activities of the recreationalists.

The overall impact on existing agricultural activities for the Salisbury to Newcastle portion of the proposed route is negligible. There is no impact for the remaining portions.

7.4.2.3 Trapping

Once actual construction of the transmission line has been completed, NB Power will only use the right-of-way to carry out scheduled maintenance and, in the event of an outage, conduct the necessary repairs. These activities should have no interactions with resource harvesters, nor should the existence of the transmission line (and towers) itself. However, another transmission line will provide access to those trapping areas which may not be currently harvested due to inaccessibility. The existence of the transmission line would be a positive but negligible impact for trappers along the entire length of the proposed route, as many trappers use exiting power lines to set their trap lines, i.e., along the power line running from Salisbury to Rogersville (and beyond the study corridor), east of Route 126 (J. Mundle pers. comm.).

7.4.2.4 Mining And Mineral Resources

Granular Aggregates

Maintenance vehicles will have access to towers located on the two sand/gravel pit sites, in the Bathurst to Belledune portion of the proposed route, through the use of existing mine roads. Therefore, maintenance activity will not affect mining operations. However, as noted in Section 7.3.2.4, there are also three undeveloped sand/gravel pit sites in this portion of the proposed route. The two active sand/gravel pits in the Bathurst to Belledune portion of the proposed route and the three undeveloped sites will lose the section of land on which towers will be built when, and if, mining occurs in these areas in the future. This is because mining near the towers could result in the towers toppling over. However, because of the extensive area covered by sand and gravel deposits in this area of the Province and the small area used by the towers in comparison to the total area available, the amount of aggregate lost through restriction of mining is rated as negligible in the Bathurst to Belledune portion of the proposed route. There would be no impact on the other portions of the proposed route.

Peat Extraction

Three commercial bogs with development potential which the proposed route will pass are located within the Salisbury to Newcastle portion of the proposed route. Maintenance vehicles could disturb the boggy terrain. As with mining aggregate resources, should towers be located on these bogs, it would not be possible to extract peat near the base of the towers when, and if, these bogs are developed. At the present time, there is no impact as the three bogs are not developed. NB Power would also avoid placing a tower on bogs, if possible. However, as the proposed route crosses the edge of one bog, the narrow section of the second bog and avoids the third bog altogether, the impacts of the existence of the transmission line on future development of this resource will be negligible. There are no impacts for the remainder of the proposed route.

Overall, the net impact of operations on mining and mineral resources is negligible in the Salisbury to Newcastle and Bathurst to Belledune portions of the proposed route and no impact for the Newcastle to Bathurst portion of the proposed route.

7.4.2.5 Airports

As the proposed route is not situated near the restriction zones of any of the airports or airstrips in the area, except that of CFB Chatham, consideration of the impact of operations is not applicable. The CFB Chatham restriction zone specifies no structures higher than 76.2 m above sea level. Since the proposed towers are below this height, the consideration of impact is not applicable.

7.4.2.6 Outfitting

Potential Interactions

Maintenance personnel may be servicing the line when outfitter clientele are using the area for fishing or hunting.

Issues and Concerns

There may be a reduced quality of experience for clientele as a result of visibility of the transmission line, i.e., reduced aesthetics and as a result of noise from any maintenance being undertaken by the crews of NB Power using the same area guides are using. There may be some audible noise associated with the energized line. In addition, increased access and perhaps use of previously inaccessible areas by recreationalists may reduce the level of harvest success for outfitter clientele.

Existing Knowledge

As noted in Section 5.2.1.7, two outfitters, the Salmon River Lodge and the Broken Feather Lodge, currently use portions of the proposed route between Salisbury and Newcastle. This area is used between May and December.

As noted in Chapter Two, NB Power employees will periodically patrol the line by air and ground to identify remedial work needed to ensure reliable and safe operation of the line. Additionally, aircraft are used in times of outages.

The Guides of one of the outfitters using the area crossed by the proposed route between Salisbury and Newcastle, the Salmon River Lodge, prefer to avoid transmission line right-of-ways (J. Mills, pers. comm.). However, the other outfitter currently using the area for outfitting activity, Broken Feather Lodge, will use the new transmission line right-of-way to access previously inaccessible areas (W. Ward, pers. comm.).

In the Salisbury to Newcastle section of the proposed route, specifically, along the Miramichi and in the Canaan Game Management Area, big game populations are plentiful (R. Currie; J. Mundle, pers. comm.).

Impact Prediction

The existence of the right-of-way could in itself, cause a loss of potential revenue for one of the outfitters. However, considering the land area available for outfitting, the right-of-way is only 50 m, the current forest cover will remain on the boundary of the right-of-way, and the abundance of big game in the area, there should be no negative impact on revenue. A negligible positive impact on revenue earned from clientele hunting could occur due to increased access to previously inaccessible areas and thus the increased probability of harvest success. This is because big game are sighted on right-of-ways and the abundance of game in the areas being hunted. This is offset by the potential increased use of the area by other recreational hunters. Overall, there is no net impact on revenue.

In consideration of the nature of any maintenance activities being undertaken and the potential small number of anglers/hunters who would be using any one particular area, the use of alternate areas should not readily create increased resource harvesting pressure in alternative areas. The impact is predicted to be negligible.

The net overall impact is negligible positive for the Salisbury to Newcastle portion of the proposed route. As there are no outfitting camps or activities within, conducted on, or near the proposed route, consideration of the impact of operational activity is not applicable for the Newcastle to Belledune portions of the proposed route.

7.4.2.7 Fox Farms

Potential Interaction

Foxes on farms located in the vicinity of the proposed route will hear the aircraft of the NB Power maintenance crew.

Issues and Concerns

There is a concern that noise from maintenance inspection aircraft and vehicles at critical times of the year will cause the foxes to abort or to kill their young and may lower the breeding success rate.

Existing Knowledge

The existing knowledge regarding the affect of noise on domestic foxes is discussed in Section 7.3.2.8. However, fox farms in proximity to the proposed route are located in the Salisbury to Newcastle only.

As noted in Chapter Two, NB Power employees will periodically patrol the line by air and ground to ensure reliable and safe operation of the line. In times of outage, helicopters also travel the transmission line. NB Power's practice is to schedule routine maintenance and aircraft flying over fox farms to non-sensitive periods. NB Power personnel are aware of all fox farms which are located in proximity to existing transmission lines.

Impact Prediction

Noise levels from the aircraft of NB Power maintenance crews could cause abortion or killing of the young (by the mother) on fox farms in proximity to the proposed route. There are three farms located within one-half kilometre of the proposed route which may be affected. The potential impacts of aircraft noise on fox farms are discussed in Section 7.3.2.8. On farms subject to aircraft noise, a significant percentage of the young could be affected (B. Trenholme, pers. comm.). Therefore, precise flight patterns of the maintenance crew in relation to farm locations will be an important mitigative measure of potential harm to the foxes. Currently, NB Power is aware of fox farms which are close to existing transmission lines and schedules maintenance operations to accommodate critical or sensitive periods. However, when outages or emergencies occur which necessitate the use of an aircraft, it may not be possible to avoid these critical periods. When warranted, NB Power has and will compensate for losses which occur. Thus, the impact is predicted to be negligible.

As there are no fox farms located in the Newcastle to Bathurst and the Bathurst to Belledune sections of the proposed route, consideration of the impact of operational activity is not applicable.

7.4.3 Communities

Potential Interactions

Residents of communities in proximity to the transmission line may be able to see the transmission line and other physical structures.

Issues and Concerns

The presence of the transmission line is not aesthetically pleasing and may discourage future expansion of the community near where the transmission line is located.

Concerns related to land value as a result of the existence of the transmission line are discussed in Section 7.4.4.1. Concerns related to public health and safety, i.e., effects of electric and magnetic fields, aircraft crashes and application of herbicides, are discussed in Section 7.4.5.

Existing Knowledge

As noted in Chapter Two, NB Power's current practice is to minimize the visual intrusion of the transmission line and right-of-way by avoiding "sky-lighting" of the line, avoiding extensive distances along the length of heavily used valleys and the provision of greenbelts at places where the right-of-way meets roads or streams.

Impact Prediction

The perception of the visual intrusion of a transmission line depends on the point of view of the observer. A home owner whose residence is situated beside such a right-of-way or a tower could feel dwarfed by the tower's relative size, but an observer viewing a line from a distance will be impressed with its small size in relation to the surrounding terrain, especially if that terrain is hilly and rolling. The construction of a transmission line does not represent a severe alteration of a landscape. In many cases, lines will become unnoticeable as familiarity lessens their visibility.

For the most part, the proposed transmission line will not be visually intrusive since it shall be placed far away from most settled areas. Possibly the only area which might be considered to have relatively high visibility within the study corridor would be the Southwest and Northwest Miramichi rivers west of Newcastle. There the line will be visible from both sides of the valley since the area is already cleared and highly developed with roads, bridges, residences, commercial establishments and the Miramichi Pulp and Paper mill.

NB Power's past experience has also shown that the future development of communities and ribbon development in the rural areas does occur in proximity to transmission lines. The transmission line acts as a "green belt" area at the back of the residential property. This "green belt" area can then be used for many purposes including gardens (NB Power, pers. comm.). The community and developers/builders incorporate the transmission line location into future development plans for the community.

The impact on community development as a result of the existence of the transmission line is negligible for all portions of the proposed route.

7.4.4 Land Status

7.4.4.1 Land Value

Potential Interactions

The operation of a transmission line may have some long-term affects on property values.

Issues and Concerns

The operation of the proposed transmission line could affect property values due to the potential noise, visual intrusion, and nuisance of the line. This change in value would depend on the specific land use, i.e., these factors would affect residential land use to a further extent than wooded or agricultural land use.

A positive issue related to the existence of the transmission line is that land owners continue to own and can use the land for most activities (excluding the growing of trees) but are compensated for the existence of the transmission line and any related structures.

Existing Knowledge

The proposed route passes through uninhabited forest and rural areas for the most part. However, it also passes near the city of Bathurst, the town of Newcastle, near the villages of Salisbury and Rogersville, and close to numerous ribbon developments, especially those near the town of Newcastle. More detail on proximity of the line to these residential areas is provided in Section 5.1.3.

Under most weather conditions, a person standing close to a transmission line would not hear any significant noise. However, this noise increases to a faint hissing in wet weather. Heavy rains can cause a higher level of noise but these are masked by the sound of rain itself (TransAlta Utilities, undated).

In terms of nuisance and visual intrusiveness, the presence of a transmission line does not affect property values. Some properties do show long-term ill effects, of course, but most seem to suffer no negative effects at all (Hawley 1981).

While variable effects on property values should be decided on an individual basis, a study completed for Ontario Hydro revealed guidelines with respect to rural and agricultural land property values; transmission lines do not appear to affect the value of land in areas strictly devoted to agricultural uses. In terms of rural properties, the transmission line appears to lower the value of the land only in those areas in which rural estate development is likely to occur. Rural estate development refers to properties where speculative activities for development purposes is taking place. However, this effect on land value also seemed to vary on a case-by-case basis (Hawley 1981).

An accredited appraiser familiar with land values in all sections of the proposed route and with experience appraising properties in proximity to transmission lines was contacted to determine the long-term effect of transmission lines on property values in rural New Brunswick; his experience has shown that the long-term affect is negligible (D. Doucet, pers. comm.).

Impact Prediction

As the portion of the Province through which the proposed route passes could be considered rural when compared to the development in southern Ontario and the value of agricultural and rural land was not generally affected, and the private property owner retains the use of the property for most activities, the impact of the existence of the transmission line is predicted as negligible but positive for private properties. As the Licensees are compensated by NB Power for the wood volume lost, the impact on the value of the Crown land is also negligible.

The overall net impact is negligible for all portions of the proposed route.

7.4.4.2 Land Rights

Potential Interactions

Since private land owners and Licensees of Crown land continue to use the right-of-way, NB Power maintenance personnel could interrupt this use.

Issues and Concerns

A positive issue which arises from the existence of a transmission line and land rights is the provision which allows the private property owner to continue to own the land over which the transmission line crosses yet be compensated by NB Power for the transmission line right-of-way. While NB Power may register an easement agreement indicating their interest in that portion of the property, the land owner may still use the land for most activities. However, NB Power does purchase some property under an option agreement or may expropriate land as a last recourse should they be unable to reach an agreement with the land owner for an easement. In these situations, NB Power owns and is responsible for the property. The question of land rights is therefore not applicable.

Existing Knowledge

The rights of property owners are not affected by the transmission line with the exception that NB Power now has the right to access the right-of-way to maintain the transmission line. The private property owner continues to own the land and may use the land for most activities provided it does not affect the transmission line. Sections 5.1.5.1 and 2.5 provide further information on the land rights of owners.

NB Power, under the authority of the **Electric Power Act**, in exercising their mandate uses private and Crown land for transmission lines to carry electricity from generating stations to users. In doing so, as noted in Section 5.1.5.1, NB Power uses three types of agreements which address the issue of owner's rights. These agreements give NB Power the right to survey, option for easement, or to purchase the property when necessary. In extreme cases when no agreement can be reached, NB Power has to expropriate the property to be used for the transmission line. This action is used with infrequently and with extreme discretion (NB Power; pers. comm). The authority to expropriate, under the larger realm of providing electricity to the Province, is granted to NB Power again under the **Electric Power Act**.

Thus, the interactions between land rights and the transmission is addressed on a legal basis. This also applies to the operation/maintenance and accidental events of transmission lines.

Impact Prediction

Although landowners may not be able to use the land during periods of maintenance, maintenance activity is of a transient nature. The impact on land rights due to operations is negligible.

7.4.5 Public Health And Safety

7.4.5.1 Electric And Magnetic Fields

Potential Interactions

The proposed transmission lines passes in close proximity to some residences, but no houses can be located within the right-of-way. People engaged in recreational activities and workers may be within the right-of-way for short periods of time.

Issues and Concerns

The issue of electric and magnetic fields has been raised in the EIA guidelines, the public consultation process and is a professional concern with the construction of new transmission lines. The concern relates to the effects of electric and magnetic fields on human health.

Existing Knowledge

Electric and magnetic fields are created wherever electricity flows through a conductor; there are fields associated with transmission and distribution lines, with wiring in homes and work places and with all electrical appliances. The issue is whether human exposure to these fields is a health risk. According to Dr. Morgan of the Department of Engineering and Public Policy at Carnegie Mellon University, good scientific research has been conducted on this topic. However, the biological effects of these fields are complicated and not fully understood and therefore risk assessment is difficult (Morgan 1989).

A large body of literature has been published regarding the possible links between electric and magnetic fields (EMF) and various health effects. Earlier studies have been contradictory and have failed to conclusively show that EMF causes any identifiable health effects. Generally, these studies have been epidemiological, that is, studies of effects on populations. These studies have been reviewed by many independent authorities such as the United States National Academy of Sciences (1977), the American Institute of Biological Sciences (1985), the World Health Organization (1984 and 1987) and the New York State Public Service Commission (1988) as referred to in Energy Resources Conservation Board of Alberta (1989), which found that "these authorities have consistently concluded that no adverse health effects have occurred from human exposure to environmental EMFs". Studies are continuing by the electric utilities and government sponsored agencies in North America and elsewhere in response to public concerns. More recent studies are discussed below.

This section will explain in simple terms some of the issues and concerns related to electric and magnetic fields, particularly in relation to transmission lines.

There are two types of fields created 60 Hz power. These are **electric fields** which result from the strength of the charge, and **magnetic fields**, which result from the motion of the charge. These fields are often referred to as **electromagnetic fields.**

The strength of electric and magnetic fields diminishes with distance from the source of the field. The strength of an electric field depends on the voltage of the object producing the field. High voltage transmission lines produce stronger electric fields than lower voltage distribution lines. It is not necessary for the current to be flowing in an object for the electric field to exist. Any appliance that is plugged in, even if it is not in use, may produce an electric field.

Magnetic fields, on the other hand, are produced by currents; stronger currents produce stronger fields. Appliances that are plugged in but not in use do not produce magnetic fields. The magnetic field is stronger if the appliance is operated on a "high" rather than a "low" setting.

The strength of an electric field is measured in units of volts per meter (V/m) or in kilo volts per meter (kV/m) for stronger fields. The strength of magnetic fields is measured in units of **gauss** and **tesla.** There are 10,000 gauss in one tesla. Field strengths for transmission lines crossing open terrain can be calculated. These calculations are more difficult and less reliable in more complex settings.

Both electric and magnetic fields can add to each other or cancel each other out depending on whether they are in phase (they are alternating in strength and direction **together**) or out of phase (they are alternating in a non-synchronous manner and will tend to cancel each other out).

Electric and magnetic fields produce a variety of biological effects, including changes in the levels of specific chemicals the body makes and changes in the functioning of individual nerve cells and the nervous system. It is not possible to say whether these changes involve health risks (Morgan 1989).

There are two kinds of studies: those conducted among people in "electrically related" occupations (line workers etc.) and those conducted among people with specific cancers, especially leukemia. It has been reported that (Morgan 1989):

> some of these studies of both kinds have found a statistical association between increases in field exposure and increased cancer rates....Many investigators believe that if they play some role, fields alone will not turn out to cause cancer (i.e. fields will not be an initiator'"). Rather they are more likely to work together with one or more other environmental factors (i.e. fields will be a "promoter'").

The Report of the Working Group on Electric and Magnetic ELF Fields (1-300 Hertz) formed by the Director General of the Environmental Health Directorate reports similar conclusions. This report concludes that (Health and Welfare Canada 1989):

- available scientific evidence on health effects of these fields is inconsistent and inconclusive;

- some epidemiological studies indicate a possible association with certain cancers and exposure to magnetic and/or electric fields;

- some animal and cell experiments indicate that an interaction between these fields with biological systems some of which may have detrimental consequences; and

- some experimental data indicates that a stronger field is not necessarily more dangerous and that some effects occur with weaker fields, but not for stronger fields.

Nair et al. (1989) conclude that the results of current scientific studies are complex and do not yet allow definite conclusions to be drawn about possible risk or to minimize or avoid potential risks. The central nervous system effects, including circadian effects in animals and the possibility of cancer promotion appear the most relevant to concerns regarding public health effects.

Significant studies include the:

- Wertheimer-Leeper (1979) study which found a positive correlation between high current configuration wiring and childhood cancer;
- Savitz (1987) which suggests that the close proximity to power lines could possibly lead to a doubling of cancer risk in children, from one case in 10,000 to two cases in 10,000;
- Stevens (1987) which considered data on adult leukemia in the Seattle area and found no association; and
- numerous other studies, many of which found no association with the particular type of cancer studied.

According to a status report on electric and magnetic fields and potential health effects produced by the American Public Power Association (1989) there are a number of court cases and actions pending against utilities to stop or reroute transmission line construction. The judicial review of the health risks of electric and magnetic fields is inconclusive:

- Klein Independent School District v. Houston Lighting & Power where the Texas Supreme Court upheld a ruling by the Texas Court of Appeals finding health risks from exposure to power line fields (the 354 kV line was rerouted from the original location 60 metres from the school);
- Seattle (Wash.) City Light decided in 1988 to delay for three to five years the construction of a transmission line and substation because of opposition by a citizens group (slower-than-anticipated demand contributed to the decision to delay construction); and

- the Energy Resources Conservation Board (Calgary) concluded in 1989 that the application for the construction of a 240-kV transmission line should not be denied on the basis of health effects and that the question of health effects should not influence its decision on the appropriate location of the line (Energy Resources Conservation Board 1989).

The U.S. Environmental Protection Agency has indicated that there is not enough compelling science to initiate federal regulations of electric and magnetic fields. Several states have their own regulations. The Office of Technology Assessment advocates "prudent avoidance" strategy including (Nair, et al. 1989):

- wider transmission line corridors;
- routing of new lines away from people;
- new low-field distribution system and house wiring designs; and
- redesigned appliances.

The Guidelines for the EIA of the Salisbury North transmission line requires that the possible implications of electric and magnetic fields to human health for residents of affected areas be addressed. The calculations at Salisbury-North for the magnetic and electric fields for the 50 m right-of-way are:

- maximum magnetic field within the right-of-way (0.24936 Gauss);
- magnetic field at edge of right-of-way (0.07023 Gauss);
- maximum electric field within right-of-way (6.581 kV/m); and
- electric field strength at edge of right-of-way (1.634 kV/m).

There are no governmental health standards for 60 Hz electric and magnetic fields in Canada. According to Health and Welfare Canada, this is due to the lack of a sufficient scientific basis to establish what such standards should be. There are standards or proposed standards in a few countries. In the United States several states have regulated the maximum electric field strength at the edge of the right-of-way to levels between one and three kV/m. Standards and proposals in other countries are similar (Health and Welfare Canada 1989). The strength of the electric field at the proposed right-of-way boundaries is well within the allowable limits where regulations have been established.

The levels of magnetic field at the boundaries of the right-of-way are similar to the upper end of magnetic fields found in homes, lower than magnetic fields found in homes near appliances and comparable to magnetic fields found in typical office environments (Health and Welfare Canada 1989).

Impact Prediction

Estimated levels for both electric and magnetic fields at the boundary of the right-of-way are not anticipated to augment risks to public health for local residents. The impact is expected to be negligible.

7.4.5.2 Aviation

There are not expected to be any impacts on aviation resulting from the maintenance of the proposed route. Potential interactions between aircraft and the transmission line are considered accidental events and are discussed in Section 7.5.5.2.

7.4.5.3 Herbicides

Potential Interaction

The proposed transmission line will require vegetation control which will be carried out manually, by mechanical means or by use of foliar sprays. There is a potential interaction with the herbicides to be applied and the public health and safety of the personnel applying the chemicals, and with residents and people participating in recreational activities in immediate proximity to the transmission lines. Any impacts of herbicide application will be the same for the entire proposed route.

Issues and Concerns

Concerns regarding the use of herbicides on the proposed transmission lines were raised at several of the public information sessions. Concerns include:

- the possibility of chemicals leaching into the groundwater;
- the possibility of the herbicide spread outside the right-of-way boundaries to non-target areas;
- the health of herbicide applicators; and
- the health of residents living in proximity to the proposed transmission lines or engaged in recreational activities or resource harvesting on the transmission line right-of-way.

Existing Knowledge

At present, NB Power uses the foliar sprays TORDON 101 and DYCLEER; the former a trade name for the combination of the active ingredients picloram (TORDON) and 2,4-Dichlorophenoxyacetic acid (2,4-D), the latter a trade name of the active ingredients dicamba and 2,4-D amine (DYCLEER 24) and 2,4-D Amine, 2,4-D Ester and 2,4-DP (DYCLEER).

TORDON 101

Concern with TORDON 101, and part of the concern relating to DYCLEER is due to the presence of 2,4-D in various formulations. The phenoxy herbicide 2,4-D was first registered in Canada in 1946. Agriculture Canada undertook a reevaluation of the chemical in 1980 because of its long history of use and its wide range of applications. The question of the carcinogenicity of 2,4-D has been raised in several studies. The Pesticides Directorate of Agriculture Canada in its CAPCO (Canadian Association of Pesticide Control Officials) summarizes current progress and outlines the current status of the product. The (January 1989) CAPCO Note includes the following:

- the U.S. Environmental Protection Agency (EPA) announced in March of 1988 that following a review of the new toxicology data and epidemiology information, i.e., National Cancer Institute (NCI) Kansas farmer study, that it did not intend to implement a special review of 2,4-D. The EPA also concluded that, "based on evidence now available, the continued use of 2,4-D would not pose a significant hazard to the environment or public health." In the September 1988 2,4-D Registration Standard (which provides a review of the scientific data base and identifies further necessary data and labelling revisions), the EPA has indicated the need for a second teratology study and a further evaluation of the existing oncogenicity studies. Some environmental impact studies have also been identified as necessary to complete the data base;

- in 1986 the Ontario Pesticides Advisory Committee of the Ontario Ministry of the Environment appointed a panel of experts to review existing experimental and epidemiological data on the carcinogenicity of 2,4-D. The report of the panel concluded:

  > **"the existing animal and human data are insufficient to support the finding that 2,4-D is a carcinogen and, consequently, finds insufficient evidence to conclude that existing uses of 2,4-D pose a significant human health risk;"**

- the Industry Task Force of Health and Welfare Canada in reviewing several epidemiology studies conducted to investigate the association of exposure to chlorophenols and chlorophenoxy herbicides and incidence of soft-tissue sarcoma (STS), non-Hodgkins lymphoma (NHL) and Hodgkins disease (HD) has found the results inconsistent and therefore recommends further studies with better exposure estimates be conducted before an association can be concluded or refuted. Because of the inconclusive nature of recent studies, Health and Welfare Canada recommends that:

  > **"appropriate measures to minimize exposure be taken when using 2,4-D"**; and

- Agriculture Canada has concluded from the studies and findings outlined in this report that the safety risks associated with 2,4-D are acceptable but that further research is necessary and that caution should be exercised in the use and handling of 2,4-D to minimize exposure.

Picloram, used by Hydro-Quebec for spraying under transmission lines caused the contamination of several wells in Ste-Dorothee, St-Jacques-de-Montcalm and Ile-Perrot. Picloram residues equal to 21 µg/L, 0.8 to 3.6 µg/L and 1.4µg/L were found in wells in 1981, 1982 and 1984 respectively (Beak Consultants Ltd. 1986).

DYCLEER

The active ingredients in DYCLEER are dicamba and various formulations of 2,4-D. Dicamba was first registered in Canada in 1963; DYCLEER was registered in 1972. Various formulations of Dicamba have been registered in 1980 (DYCLEER 24), 1981 (DYCLEER 12), 1983 (Banvel 10G), and 1985 (Killex 500). Although there is a paucity of information available related to dicamba and human health, a Pesticide Information Officer with the Pesticides Directorate of Agriculture Canada has reported that the data and analysis requirements on chemicals registered in the 1980s is much more comprehensive than earlier registrations (S. Belliveau, pers. comm.).

Dicamba, 2,4-D and Picloram are all on the EPA list of pesticides with high potential for leaching into groundwater (Journal Pesticide Reform 1989).

As indicated in Chapter Two, NB Power will apply TORDON 101 and DYCLEER following label instructions and specifications set out under the **Pesticides Control Act** and the **Clean Environment Act.** The Environmental Protection Branch of the Department of the Environment (K. Brown, pers. comm.) has reported that because information on herbicides is sometimes equivocal, the Department has a three-tiered process to minimize risk, including requirements for:

- a permit for pesticide use with conditions of use and required protective clothing for operators;
- the licensing of operators by the Department of the Environment which includes the requirement of environmental liability insurance; and
- the certification of the operators who will apply the chemicals.

Potential Impacts

Scientific information on the effects of these chemicals on human health is inconclusive but generally supports continued use with conditions which will minimize contact with people and with groundwater supplies. The impact on public health and safety of herbicide application applied under the conditions outlined in Chapter Two is anticipated to be negligible.

7.4.5.4 Induced Current

Potential Interactions

There is a potential interaction which occurs between induced current (current generated as a result of the existence of the transmission line) and NB Power personnel, other recreationalists and property owners who may also be using the transmission line right-of-way.

Issues and Concerns

Concerns related to induced charge include those activities which may potentially affect the public health and safety of persons underneath the transmission line if proper precautions are not taken.

Existing Knowledge

The following may be affected by induced charge (TransAlta Utilities, undated; J. Little, pers. comm.):

- fencing which is parallel or near a transmission line may pick up an induced charged greater than that normally found in electric fences;

- large fires underneath a transmission line can form a conductive path carrying electricity;

- refuelling machinery or equipment underneath transmission lines can ignite fires by sparks from induced voltages igniting gasoline vapours;

- irrigation systems, and machinery and equipment underneath a transmission line may pick up a small charge through induced charge; and

- blasting underneath the transmission line ionizes the gas and could cause a short circuit.

NB Power's current practice is to advise their personnel of the affects of induced charge. Information may also be provided to property owners but on an ad hoc basis.

Potential Impacts

Due to the small number of people which could be potentially affected and in consideration of the possible affects of an induced charge, the impact is rated as negligible.

7.4.6 Communications

Generally speaking, there are very few concerns regarding the proximity of the proposed transmission line to microwave towers. CNCP was concerned whether their microwave beams would intersect a tower or the transmission line itself within 1.6 km of the antenna, and about buried communication cables (S. Baker, pers. comm.). NB Tel stated that the placement of transmission lines within ± 300 metres would not interfere with their microwave signal.

None of the communications tower sites are situated closer than 2.5 km to the proposed route. Consideration of impact is therefore not applicable.

7.4.7 Historic And Archaeological Resources

There will be no impact on this resource as a result of the existence of, or the maintenance of the proposed transmission line.

7.4.8 Summary of Operation/Maintenance Activity Impacts

The impact of operation and maintenance on Valued Socioeconomic Components is summarized in Figure 7-3.

7.5 Impacts Of Accidental Events

The primary categories of accidental events relate to forest fires, fuel or herbicide spills, and vehicular accidents between residents and NB Power construction and maintenance equipment.

There has been an average of 12 aircraft accidents per year in the past ten years in New Brunswick but, none of these local or commercial aircraft accidents have involved transmission lines (D. Owen, pers. comm.). Thus, although there is a possibility that aircraft accidents could be caused as a result of transmission lines, the probability of such an event occurring, based on past experience, is remote. The impact is thus rated negligible.

The frequency and nature of fuel and chemical spills is much more difficult to quantify. However, spills during construction or maintenance would normally involve small quantities of fuel (less than 225 litres). There have been no major spills resulting the contamination of watersheds or watercourses. Due to the low probability, the impact is negligible.

Although there are no data, the probability of accidents involving NB Power vehicles and off-road construction equipment is low. Over the life of the project, and in consideration of the short duration of the construction and maintenance season, the impact is rated as negligible.

The overall probability of a transmission related accident involving death or serious injury results in a rating of no impact to negligible impact.

Accidental events related to transmission lines are more likely to affect the following Valued Socioeconomic Components:

- forestry;
- communities;
- land value; and
- public health and safety.

There is the possibility that there could be an interaction with any of the Valued Socioeconomic Components. For instance, a forest fire could affect all of the activities which take place within the portion of the proposed route when the fire occurred. As the possibility of such an event being caused as a result of the construction or operation of the transmission line is remote, this section will deal only with the most significant potential interactions, as indicated in the above listing. However, impact ratings have been included for all Valued Socioeconomic Components in the summary of impacts (Figure 7-4).

7.5.1 Forestry

Potential Interactions

Accidental events associated with construction and operation of the right-of-way could have the following potential interactions with the surrounding forest resource:

- workers could accidentally start a forest fire; and
- any low flying aircraft, including those flying the line during routine maintenance could crash, possibly resulting in a forest fire.

Issues and Concerns

The issues and concern of the forest industry involve the loss of revenues due to the occurrence of forest fires.

Existing Knowledge

Of the 224 forest fires in the Province in 1988, 52 of these were in Region 1 (Bathurst), 26 were in Region 2 (Newcastle), and 46 were in Region 3 (Hampton) (DNRE 1989). Out of a Provincial total of 1,976 ha which were burned in 1988, these fires burned 1,702 ha (86 percent), 80 ha (4 percent), and 76 ha (4 percent), respectively. However, in 1986, in Region 2, 82 fires burned a total of 28,916 ha (74 percent of the Provincial total) (DNRE 1989). Region 2 ranks highest in the ten-year (1979-1988) average area burned (3,162 ha/year, or 55 percent of the Provincial total). Although, the 224 forest fires recorded in 1988 were grouped by cause, cause was not provided by Region.

NB Power and its contractors comply with governing Regulations associated with forest fire prevention.

As noted in preceding paragraphs, the probability of a maintenance aircraft crashing and causing a forest fire is extremely low; there has never been any accidents involving NB Power aircraft and transmission lines. Over the past ten years, there has not been any other local or commercial aircraft accidents which have involved transmission lines (D. Owen, pers. comm.).

Impact Prediction

Accidental events during construction such as forest fires caused by construction crew activities could have significant impacts on the surrounding forest. Despite compliance with Regulations, the potential for forest fires exists along the route. The potential impact is rated as moderate, although the impact could range from negligible to moderate.

7.5.2 Communities

Potential Interaction

The proposed transmission line will have the following potential interactions with residents in proximity to the proposed route:

- the aircraft could crash in the community or ribbon development; and
- residents could be using the same roads within the proposed route as on-road NB Power construction personnel.

Issues and Concerns

The issues and concerns identified during the public consultation process and the surveys include:

- fear of aircraft crashes into transmission lines;
- increased risk of forest fire due to increased risk of aircraft crashes and additional people in the forest;
- impact of project activities in wildlife and fish; and
- increased chance of traffic accidents as other drivers become annoyed with inability to pass the slow moving NB Power trucks or equipment (highways have few passing lanes) and as a result of residents using the same access roads as NB Power in the proposed route.

Existing Knowledge

Existing knowledge with respect to aircraft accidents, fuel or chemical spills, and traffic accidents which have occurred with NB Power aircraft or construction equipment used in the construction or maintenance of transmission lines is provided in the preceding paragraphs.

Impact Prediction

As discussed above, the impact on the communities would be a major one should any of the accidental events occur. However, due to the number of households which could be potentially affected and the small probability that the accidental events could occur, the overall impact on communities is rated as negligible.

7.5.3 Land Status

7.5.3.1 Land Value

Potential Interaction

Accidental events related to the construction and operation of the transmission line could decrease the value of property.

Issues and Concerns

In the event that an accident occurred during maintenance and construction, it is possible that property value could be affected. A fire or any major contamination to the property surrounding a transmission line could decrease property values substantially, i.e., a piece of residential land whose well has been contaminated would be very difficult to sell at market value.

Existing Knowledge

NB Power's past experience has indicated that these types of events, while they are possible, have not occurred in New Brunswick in recent years (NB Power, pers. comm).

Impact Prediction

Should a forest fire or chemical spill occur which contaminates a water source occur, the impact could be great. However, in light of NB Power's past experience and the remote possibility that this event could occur as a result of NB Power construction or maintenance activities, and the small number of residences or properties which could be potentially affected, the impact is rated negligible.

7.5.4 Public Health and Safety

7.5.4.1 Aviation

Potential Interactions

The interaction between aviation and the transmission line will occur in the event of an aircraft crash into the transmission line or structures.

Issues and Concerns

The visibility of the transmission line to a low-flying aircraft may be such that an aircraft flies into the transmission line with a resulting loss of life.

Existing Knowledge

Most of the major routes used by commercial air traffic are situated in the southern portion of the Province, with Moncton as the hub. North from Moncton there is a route between Moncton and Newcastle and between Newcastle and Bathurst. The entire Province is within the Moncton Flight Information Region. North of Bathurst, routes travel to Charlo and points north. Local air traffic emanates from the airstrips described in Section B.2.4.3.2, Appendix B.

Local air traffic uses a much lower air space than the commercial air traffic described in Chapter Four. Warning balloons and sometimes strobe lights are often placed on conductors which span rivers (D. Owen, pers. comm.). Rivers wide enough to require such balloons, and which are crossed by the proposed route in the Salisbury to Newcastle portion include the Petitcodiac, the Barnaby, and the Southwest and Northwest Miramichi Rivers. There are no rivers wide enough to require such balloons in the Newcastle to Bathurst portion of the proposed route. In the Bathurst to Belledune portion of the proposed route, the Nepisiguit, Middle and Tetagouche Rivers would require such a balloon.

There has only been one accident reported involving aircraft and transmission lines in New Brunswick in the last ten years (D. Owen, pers. comm.). It involved a balloon attempting to land in a field which struck and snagged on high tension power lines and caught fire. This accident resulted in one fatality.

Impact Prediction

As the constraint zones around all major and local airports are avoided by the three segments of the proposed route; impacts on high altitude commercial air traffic are thus expected to be nil. The measure of attaching balloons to conductors which cross major rivers along the proposed route will increase the visibility of the conductors and lessen the potential of low-flying aircraft following the rivers colliding with the transmission line. The impact of accidental events concerning crashes of aircraft into transmission line towers and conductors is rated negligible.

7.5.4.2 Herbicides

The major accidental event concerning foliar sprays is the accidental spillage or accidental spraying of non-target areas.

Issues and Concerns

Of major concern is the accidental contact of the foliar sprays by the public. Another concern is the accidental spillage of an amount of the foliar sprays into a watercourse, and the effects it may have on wildlife.

Existing Knowledge

As stated in Section 7.3.2.5, the chemical picloram (in TORDON 101) has a low toxicity to aquatic animals and wildlife and no ill-effects on sheep, pigs, cattle or poultry during feeding trials (CCOHS 1985). All sections to be sprayed are posted with signs advising the public to that effect, and all areas along a specific section which are not to be sprayed are marked with a physical barrier, i.e., they are ribboned off. Spray programs are contracted out to licensed bidders who are responsible for any and all precautions in the field (Gauvin 1985) and are indemnified and sign a one-year bond with NB Power. NB Power personnel observe the application of the foliar sprays along an entire section and New Brunswick Department of the Environment personnel make field inspections to ensure the proper procedures are being followed and guidelines are being met.

Impact Prediction

Any impacts of accidental events concerning herbicides will be the same for the entire length of the proposed route.

As NB Power posts signs wherever and whenever the herbicide is to be applied (Gauvin 1985), the chance of the public coming into contact with the foliar sprays is slight. As incidental contact with the chemical (2,4-D) cannot be made once it has dried on the plant and does not cause any long-lasting irritation, accidental contact with the foliar sprays should produce negligible impacts.

7.5.5 Summary of Accidental Events Impacts

The impact of accidental events on Valued Socioeconomic Components is summarized in Figure 7-4.

7.6 Cumulative Impacts

As discussed in Section 6.6, it is tenuous to describe the cumulative effect of socioeconomic impacts separate from their associated biophysical impacts. From a socioeconomic perspective, the total effect of cumulative impacts is dependent upon the nature of the receiving or host environment, human tolerance levels, and psychosocial characteristics. Many socioeconomic effects, largely focused on human use of the environment, are constrained by the subjective perceptions of human beings in general. In this context, differentiating between levels of impact significance becomes obscured by the value system prevalent in a particular societal group. What constitutes a minor impact in one group may be considered a major impact by another less tolerant or habituated (to the effect) group. The current value/psychosocial systems have been determined largely on the basis of the previous knowledge/exposure of the study team to the regions in question, and the result of the public consultation process, the local government information sessions and the surveys (Appendices D and E). These initiatives have permitted the development of an evaluation framework used to determine the significance of the effects presented in previous sections of this Chapter.

In the evaluation of cumulative socioeconomic effects it is necessary to establish the threshold at which the sum of a variety of effects culminate in a total impact which exceeds the tolerance level of a particular group. There is little in the literature which would assist to define this point/level in even a general sense.

The evaluation of socioeconomic cumulative effects is also highly dependent upon the current status of the host environment. In this regard, it is recognized that human tolerance levels are conditioned by the existing situation. For example, a long-term resident of a primarily rural environment has initial difficulties coping with the audible and visual stimulation of an urban environment, whereas to a long-time urbanite, these same stimuli are accepted as "normal".

As was described for biophysical cumulative impacts (Section 6.6.1), it is also true that Valued Socioeconomic Components are subject to a variety of impacts (other than the transmission line) which directly and/or indirectly contribute to an alteration of the pre-project condition. With regard to the proposed transmission line, for example, canoeing (to name one) is subject to a number of man-made and natural intrusions. In the proposed route, there is presently a high level of forest industry activity contributing to visual and auditory intrusions which exceed ambient levels. The proposed route is also subject to various natural disasters such as forest fires and major wind storms, all of which would serve to degrade the quality of the existing vegetation and landscape and thus, the quality of the recreational experience.

With the limitations in our ability to meaningfully assess cumulative impacts in mind, an effort has been made to identify the potential for the construction and operation activities related to the proposed transmission line to have a cumulative impact on the Valued Socioeconomic Components. Cumulative impacts have been assessed for those Valued Socioeconomic Components rated minor negative or greater. For those Valued Socioeconomic Components rated negligible or minor positive, impacts were not considered to measurably contribute to cumulative negative impacts. Only two Valued Socioeconomic Components, forestry and historic and archaeological Resources, had an impact rating of minor negative or more. The overall impacts of the construction and operation of the proposed transmission line are not expected to contribute measurably to the cumulative impacts on these Valued Socioeconomic Components.

CHAPTER EIGHT

MITIGATION, RESIDUAL IMPACTS, COMPENSATION, AND MONITORING

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8.0 MITIGATION, RESIDUAL IMPACTS, COMPENSATION, AND MONITORING

This Chapter presents the mitigation and compensation programs which NB Power has used in the past and plans to implement to minimize adverse impacts and maximize project benefits. Where further work is required to develop mitigation and compensation programs, the required steps are clearly identified. The responsibilities of parties-at-interest, including NB Power, Provincial and federal agencies, and the public, are outlined with regard to the establishment of mechanisms by which impacts and issues can be resolved as they emerge through the construction and operational phases of the development.

The residual impacts, those impacts which are predicted to remain following the application of all practical mitigation measures, which have been implemented as proposed, are also presented.

8.1 Mitigation

The refinement of NB Power's mitigation strategy for the reduction of potential impacts has involved a number of phases. The mitigative measures developed prior to this EIA Study are incorporated into the project description (Chapter Two) and Route Selection Study (Appendix B). The Route Selection Study has been conducted to select the proposed and alternative routes which minimize interaction with Valued Environmental Components. NB Power has proposed a development strategy that is sensitive to environmental concerns, and which incorporates an environmentally-responsible approach to construction and operation of the proposed transmission line.

CEARC (1988) observed that priority should be given to the application of impact prevention measures in the earliest possible stages of the planning process. Compatible with this observation, the development of NB Power's mitigation strategy has involved, from the outset, the application of its environmental policy and the experience it has gained in the operation of its transmission lines throughout New Brunswick.

The project description (Chapter Two) reflects the degree of commitment to mitigation that NB Power has incorporated into its early planning process. In many instances, NB Power's mitigative strategy involves a commitment to implement environmentally-responsible construction and operation practices. Such measures are routinely implemented by NB Power in the construction and operation of its transmission facilities. Other mitigative measures which have been presented in Chapter Two reflect a commitment to adhere strictly to all applicable laws, regulations and guidelines. As well, the mitigation measures outlined are designed to meet the specific needs of protecting the natural environment along the proposed route.

In keeping with the study strategy (Chapter One), NB Power has employed an approach to EIA that focuses on Valued Environmental Components. The biophysical and socioeconomic impact assessments presented in Chapters Six and Seven, respectively, have resulted in a series of impact ratings which identify the expected severity and duration of the impacts, the degree of uncertainty of an impact prediction and the value of the affected Valued Environmental Component. The impact analysis provides the basis for the development of mitigative measures appropriate for the construction and operation of the proposed transmission line. CEARC (1988) noted that it is an important goal to mesh the ecological and social considerations into the process of selecting mitigation measures in this way.

Further refinement of the mitigation strategy will be achieved through the review of the EIA Study Report by the Review Committee and the public. Issues raised during the review of this report, and at Public Meetings, will be taken into account during project implementation.

Specifically, this Section presents the proposed mitigation program as follows:

- route selection;
- avoidance and scheduling;
- environmental protection planning;
- specific biophysical mitigation;
- specific socio-economic mitigation; and
- mitigation of cumulative impacts.

8.1.1 Route Selection

As part of this study, NB Power has conducted a comprehensive Route Selection Study within the study corridor as described in Appendix B. A proposed route and alternative route segments have been selected to satisfy the requirements of the EIA Guidelines (Appendix A).

The Route Selection Study represents an important means of mitigation. By avoiding interaction with areas of constraint, many of the potential environmental impacts have been avoided. This exercise reinforces NB Power's commitment to implement the recommendations of CEARC (1988) to give priority to the application of impact prevention measures in the earliest possible stages of the planning process.

8.1.2 Avoidance and Scheduling

NB Power is committed to the avoidance of important or sensitive wildlife, ecological, human occupation and resource use areas as outlined in this report or as identified in future as a result of new information becoming available. Avoidance is considered to be an effective, practical, and manageable form of mitigation.

For the purposes of avoidance mitigation, it is necessary to define two terms:

- avoid; and
- minimize.

The use of the term "avoid" in this context is straightforward in that NB Power will, under all circumstances, keep away (spatially and/or temporally) from a defined area. The only exception to this may be in an emergency situation where it is necessary to enter an avoidance area.

The use of the term "minimize" is somewhat more subjective. In the context of avoidance criteria, it is NB Power's intention that "minimize" indicate that an activity or defined area will be avoided except where it is not possible to do so without compromising the intended purpose of the transmission of electrical power. It reflects NB Power's objective to reduce the frequency and magnitude or eliminate negative interactions with the receiving environment by planning its construction and operational activities to avoid critical areas and periods.

In the spirit of this objective, NB Power will cooperate with and facilitate the regulatory environmental surveillance by federal and Provincial agencies. However, while NB Power will plan its activities to reduce or eliminate negative interaction with the receiving environment, it remains that the objective of transmission of electrical power must be realized.

The following list summarizes the criteria which NB Power intends to implement for this project:

- avoidance of all activities within a 30 m buffer zone along all watercourses, except at stream crossings approved under the **New Brunswick Watercourse Alteration Regulation - Clean Environment Act**;
- minimize the number of fording of all watercourses, particularly between September 15 and May 15;
- minimize exposure of deer and moose wintering areas, between December 15 and April 15, to routine construction and maintenance activities, and low-level flying by maintenance inspection helicopters;
- minimize terrain disturbance and construction activities during wet periods, to minimize erosion, and consequent degradation of fish habitat and water quality;
- avoid overflying fox farms within 1.5 km between late February and mid-May and minimize vehicular activity within 0.5 km in the same period; and
- avoid all presently known and newly discovered archaeological sites.

In addition to this, NB Power is fully committed to updating or modifying its avoidance criteria as new information becomes available through monitoring, consultation with government agencies, through information identified by the public as important for avoidance (where feasible and appropriate).

8.1.3 Environmental Protection Planning

In the last ten years, several large scale developments in Atlantic Canada have used EPP's and a coordinated Environmental Compliance Monitoring program to facilitate the mitigation of predicted environmental impacts. This experience has resulted in a very substantial improvement in the level of environmental compliance for environmentally-sensitive projects.

NB Power has prepared and uses a Generic Environmental Protection Plan (EPP) for the management of project-related impacts. The EPP will provide the practical framework for implementing the environmental requirements and mitigation for the construction and operation

of the proposed transmission line. The EPP will be, to a large extent, the tool for the practical application of much of the mitigation proposed in this chapter and in Chapter Two.
The EPP is a consolidation of all of the environmental mitigation procedures for the construction and operation of NB Power transmission lines. The intent of the EPP is to facilitate compliance with the applicable laws, regulations, permits, guidelines and contingency plans as outlined this EIA Study Report. The EPP will also provide regulatory authorities and other interested parties a benchmark against which to judge compliance.

The main objectives of the EPP are as follows:

- document environmental concerns and appropriate protection measures;
- provide concise and clear instructions to project personnel regarding procedures for protecting the environment and minimizing environmental impact; and
- ensure that NB Power's commitments to minimize environmental impacts will be met.

8.1.3.1 Contingency Plan

As noted by CEARC (1988) a contingency plan cannot prevent or minimize adverse impacts in the same way that mitigation can. Contingency planning is a way of approaching impacts which remain after mitigation. Notwithstanding this, contingency plans are often incorporated into EPP's. Thus, for environmental accidents and unforeseen environmental problems, NB Power's contingency plans are to a large extent incorporated in the Generic EPP. This includes but is not necessarily limited to contingency planning for fuel spills, hazardous material spills, wildlife encounters and forest fires.

8.1.4 Summary of Biophysical Mitigation

A summary of biophysical impacts is provided in Figures 6-2 to 6-4. A summary of the mitigation proposed for each negative impact which was rated as minor or greater (Chapter Six) is presented in Tables 8-1 and 8-2. Comments on specific aspects of the mitigation proposed are also included. The residual impacts, those which remain after all practical mitigation measures have been implemented as proposed, are also presented. These are discussed in Section 8.2.

TABLE 8-1: MITIGATION OF BIOPHYSICAL IMPACTS - SALISBURY TO NEWCASTLE TO BATHURST

Project Activity Valued Environmental Components (impact)	Mitigation	Comments	Residual Impacts
Construction			
White-tailed Deer (minor)	avoidance	minimize construction activities in wintering areas between Dec 15 and April 15	minor (reduced)
Operation/ Maintenance			
White-tailed Deer (minor)	avoidance	minimize ground maintenance activities in, and flights over wintering areas between Dec 15 and April 15	minor (reduced)
Accidental Events			
Marten (minor)	EPP Contingency Plan	reduce frequency and impact of accidental forest fires and other events	minor (likelihood reduced)
Upland game birds (minor)	EPP Contingency Plan	reduce frequency and impact of accidental forest fires and other events	minor (likelihood reduced)
Atlantic salmon (minor)	EPP Contingency Plan	reduce frequency and impact of accidental forest fires and other events	minor (likelihood reduced)
Brook trout (minor)	EPP Contingency Plan	reduce frequency and impact of accidental forest fires and other events	minor (likelihood reduced)
Water quality (minor)	EPP Contingency Plan	reduce frequency and impact of accidental forest fires and other events	minor (likelihood reduced)

TABLE 8-2: MITIGATION OF BIOPHYSICAL IMPACTS - BATHURST TO BELLEDUNE

Project Activity Valued Environmental Components (impact)	Mitigation	Comments	Residual Impacts
Accidental Events			
Marten (minor)	EPP Contingency Plan	reduce frequency and impact of accidental forest fires and other events	minor (likelihood reduced)
Upland game birds (minor)	EPP Contingency Plan	reduce frequency and impact of accidental forest fires and other events	minor (likelihood reduced)
Atlantic salmon (minor)	EPP Contingency Plan	reduce frequency and impact of accidental forest fires and other events	minor (likelihood reduced)
Brook trout (minor)	EPP Contingency Plan	reduce frequency and impact of accidental forest fires and other events	minor (likelihood reduced)
Water quality (minor)	EPP Contingency Plan	reduce frequency and impact of accidental forest fires and other events	minor (likelihood reduced)

8.1.5 Summary of Socioeconomic Mitigation

A summary of socioeconomic impacts is provided in Figures 7-2 to 7-4. The mitigation proposed for each negative impact which was rated as minor or greater (Chapter Seven) is presented in Table 8-3. Comments on specific aspects of the mitigation proposed are also included. The residual impacts, those which remain after all practical mitigation measures have been implemented as proposed, are also presented. These are discussed in Section 8.2.

8.1.6 Mitigation of Cumulative Impacts

The cumulative impacts discussed in Chapters Six and Seven will be mitigated through the biophysical and socioeconomic mitigation presented for specific Valued Environmental Components as outlined in this chapter. Outside of mitigating the impacts which are directly related to the proposed construction and operation activities, no mitigation specific to cumulative impacts is proposed.

8.2 Residual Impacts

Residual impacts are those which remain after all practical mitigation measures have been implemented as proposed. Residual impacts include those which were reduced but not eliminated, and those for which mitigative measures are not possible or not implemented. The residual impacts are identified for biophysical impacts in relation to mitigation in Tables 8-1 and 8-2, and for socioeconomic impacts in Table 8-3.

As noted in Chapters Six and Seven, many of the interactions between the project and the biophysical and socioeconomic environment result in negligible impacts that do not require mitigation. Some impacts, however, are predicted to have higher levels of impact. For the most part, mitigation has reduced predicted impacts to levels of minor or negligible. The noted exceptions include accidental events where the risk of accidents can be reduced, but not eliminated.

8.3 Compensation for Socioeconomic Impacts

This EIA Report does not consider the funding requirements or responsibilities for the implementation of compensation programs. With regard to compensation to communities and the public, the quantification of the issues is extremely difficult. Also important to consider is the fact that most large projects generate important local spin-off benefits in the form of

TABLE 8-3: MITIGATION OF SOCIOECONOMIC IMPACTS - SALISBURY TO NEWCASTLE, BATHURST AND BELLEDUNE

Project Activity Valued Socioeconomic Components (impact)	Mitigation	Comments	Residual Impacts
Construction			
Forestry (minor)	nil	loss of 1,250 ha of productive forest land	minor
Historical and archaeological resources (minor)	EPP Contingency plan	conduct survey of areas of high potential prior to construction	minor (likelihood reduced)
Operation/ Maintenance			
Forestry (moderate)	nil	encourage use of right-of-way for Christmas tree plantations	moderate
Accidental Events			
Forestry (moderate)	EPP Contingency plan	reduced frequency and extent of accidental forest fires	moderate (likelihood reduced)

construction and operation employment, increased labour income and increased purchases of operation-related goods and services. Because of these positive economic repercussions, the negative impacts associated with a project become somewhat easier to accept.

Despite a comprehensive mitigation strategy, the proposed transmission line development will result in some impacts; this is clearly identified in Chapters Six, Seven and Eight. The development of a compensation program at this time, however, is problematic as the level of confidence and range of possible impact ratings, and the effectiveness of mitigation is not known for some potential impacts. There is a need for the monitoring of the most sensitive or critical Valued Environmental Components to:

- verify impact predictions;
- evaluate the effectiveness of mitigation;
- revise mitigation procedures, where warranted; and
- confirm impact levels and develop a sound basis for compensation which reflects the need for compensation.

Section 8.4 outlines monitoring programs for Valued Environmental Components to monitor the status of sensitive and critical Valued Environmental Components with respect to the objectives listed above.

NB Power is committed to develop a compensation package to address compensation issues. Over the years, NB Power has developed several compensation policies to address specific issues. These will be implemented as appropriate during this project. Compensation will be offered to private land owners and Timber Licensees as described in Chapters Two and Seven.

8.4 Monitoring

There are two distinct types of Environmental Monitoring that are normally carried out in association with EIA in Canada:

- Environmental Compliance Monitoring; and
- Environmental Effects Monitoring.

In the broadest sense, Environmental Compliance Monitoring (ECM) includes all environmental monitoring of a proponent's activities by regulatory authorities and the proponent, to ensure compliance with all regulatory and self-imposed environmental requirements (Barnes, et al. 1986). Environmental Effects Monitoring (EEM), is defined as environmental monitoring which is done to validate impact predictions, and evaluate the effectiveness and identify the need to alter or improve mitigative and compensatory measures. Outlined in this chapter, NB Power's proposed monitoring program involves the use of both ECM and EEM.

8.4.1 Environmental Compliance Monitoring (ECM)

NB Power is fully committed to implementing an ECM program. The prime vehicle for ECM, both for regulatory authorities and NB Power, will be the Generic Environmental Protection Plan (EPP) (Section 8.1.3). The EPP provides the practical framework for implementing the environmental requirements of the proposed transmission line construction and operation. To facilitate regulatory environmental surveillance, NB Power will co-operate with appropriate government agencies (Section 8.1.3).

8.4.2 Environmental Effects Monitoring (EEM)

EEM is the taking of repetitive measurements over time of environmental variables to detect changes caused by external influences directly or indirectly attributable to a specific anthropogenic activity or development (Duinker 1985). EEM is undertaken for many reasons such as to:

- improve environmental understanding of cause and effect relationships;
- provide an early warning of undesirable change in the environment; and
- verify earlier predictions to lower uncertainty or risk.

Beanlands and Duinker (1983) concluded that EEM must be well defined and focused to prevent the concept from becoming an excessive drain on time and financial resources. They noted that certain predicted changes may not require EEM and thus EEM should be concentrated on changes in those components most poorly understood or most critically in need of protection. NB Power recognizes its responsibility and is committed to the development of a focused Environmental Effects Monitoring (EEM) program in keeping with these conclusions.

NB Power has developed its EEM program carefully, following the recommendations of Barnes, et al. (1985):

- the EEM program must be very conscious of the reason for and benefit of the study, and ensure that the program is scientifically practical;
- EEM studies should be identified early in the EIA process, preferably during scoping, but there should be flexibility to accommodate EEM studies that are identified at a later date; and
- EEM studies should be designed and conducted as scientific studies; they require clear objectives and hypotheses, temporal and spatial controls, and adequate duration, practical methodologies, and sufficient funding.

Further, NB Power has considered the following principles in developing its EEM program:

- it is important to focus on Valued Environmental Components of greatest ecological and social concern, and those which are least known or understood;
- studies should be designed to allow the attribution of cause and evaluate the relative effectiveness of mitigative measures; and
- studies should be designed to fill data gaps where it is required for the development of mitigative and compensatory measures.

With respect to the latter principle, the mitigation and compensation program proposed in this Chapter is properly termed adaptive environmental management. Adaptive management requires periodic evaluation of the status and trends of the managed system, to determine the responses of Valued Environmental Components, along with revised projections of the potential effects of changes in actions (Salwasser and Samson 1985). It provides a mechanism for managers to make immediate use of new data and knowledge, to further reduce the magnitude and extent of adverse interactions with project activities. NB Power recognizes the need to apply the principles of adaptive management to refine and improve the effectiveness of its proposed mitigation program.

A proponent is responsible for seeing that an acceptable EEM program is carried out and for funding it. NB Power is prepared to conduct EEM studies where the information is essential for decision-making relative to the environmental acceptability of its proposal. NB Power is also prepared to monitor the success of its mitigation program as a basis for compensation.

It is felt that by using this focused approach to the development of the EEM program, NB Power will be able to mitigate and minimize predicted project impacts. It is clear at this time that several Valued Environmental Components will require consideration for inclusion in a focused EEM program. These include, but would not necessarily be limited to, all of those Valued Environmental Components for which residual impacts are predicted to be minor or greater.

The following sections outline the two studies which comprise NB Power's proposed EEM Program. For each study the following parameters are identified:

- requirement;
- objective; and
- responsibility.

8.4.2.1 Electric and Magnetic Fields

Requirement

Given the current level of research into the possible impacts of electric and magnetic fields, NB Power will monitor the actual levels of EMF along the right-of-way when the line is energized to ensure that they are maintained with current standards.

Objectives

The objective of the investigation will be to confirm the predicted levels of EMF. Further, it will be important to monitor these levels from time to time.

Responsibility

NB Power is fully responsible for the conduct of this EEM study.

8.4.2.2 Osprey

Requirement

It is likely that Osprey will nest on the proposed line. It is thus important to monitor the location, number and status of nests so that mitigative measures can be implemented as necessary. NB Power is currently participating in a joint EEM Study with DNRE on all of its transmission lines.

Objective

The objective will be to incorporate the proposed line in the on-going EEM Study and stewardship program being jointly undertaken by NB Power and DNRE (Section 6.4.4.3).

Responsibility

NB Power will continue to cooperate on a similar basis with DNRE on this on-going stewardship program and EEM Study.

CHAPTER NINE

CONCLUSIONS

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9.0 CONCLUSIONS

This EIA Study has followed a well-defined study strategy (Chapter One) which has involved the selection of a proposed and alternative routes to avoid interaction with Valued Environmental Components. A detailed project description (Chapter Two) has facilitated the identification of potential interactions of project activities, i.e., construction, operation, and accidental events, with Valued Environmental Components.

The biophysical and socioeconomic impact assessments (Chapters Six and Seven), which evaluate the impacts of project activities on Valued Environmental Components, have determined that without mitigation, there are only a few impacts which are predicted to be minor or greater. Overall, the Route Selection Study (Appendix B) has minimized or avoided potential impacts. Impact predictions are summarized by project activity for both biophysical impacts (Figures 6-2 to 6-4) and socioeconomic impacts (Figures 7-2 to 7-4). They are based on a rigorous impact rating scheme (Figures 6-1 and 7-1) which provides, in addition to the impact rating, the level of confidence, range of possible impact ratings, the geographical extent of the impact, the duration of the interaction, and the frequency of occurrence.

Further, the cumulative impacts are evaluated for each Valued Environmental Component. These take into account the importance of the potential construction, operations and accident related impacts in the context of other external project influences. Overall, the level of contribution of project activities on cumulative impacts is considered to be non-measurable, except with respect to some potential accidental events.

With the application of a comprehensive mitigation program, many of the predicted impacts can be reduced to levels of negligible or no impact (Tables 8-1 to 8-3). Notwithstanding mitigation, the residual impact analysis (Section 8.2) determined that there are numerous negligible or no residual impacts, with only two impacts rated as moderate (forestry in relation to normal operations and accidental events), and a few which are minor.

To further characterize and potentially reduce predicted impacts, NB Power has proposed, a Monitoring Program which is comprised of both Environmental Compliance Monitoring and Environmental Effects Monitoring Studies. The Environmental Compliance Monitoring program outlines how NB Power intends to ensure it complies with regulatory requirements through Environmental Protection Planning and Contingency Planning. The Environmental Effects Monitoring program is comprised of two focused studies which address critical issues or Valued Environmental Components, the monitoring of EMF and Osprey.

Overall, the mitigation, monitoring and compensation proposed will serve to refine and further reduce the net impact rating of the proposed construction and operation of the proposed transmission line.

In view of the findings of this EIA Study Report, it is concluded that it would be acceptable to proceed with the proposed transmission line development. However, this conclusion is predicated on the fact that to effectively manage potential impacts, NB Power must rigorously implement the proposed mitigation, monitoring and compensation program to minimize negative impacts and maximize positive impacts.

CHAPTER TEN

REFERENCES

10.0 REFERENCES

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CHAPTER ELEVEN

PERSONAL COMMUNICATIONS

11.0 PERSONAL COMMUNICATIONS

Adams, P., Indian and Native Affairs Canada, Lands, Resources and Trusts Branch, Amherst, N.S.

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Belliveau, S., Information Officer, Pesticides Directorate, Agriculture Canada, Ottawa, 1990.

Boer, A., Wildlife Research Unit, University of New Brunswick, Fredericton, N.B.

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Brown, K., Environmental Protection Branch, DOE, Fredericton, 1990.

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FREDERICTON, N.B.

SALISBURY-NORTH 345KV
TRANSMISSION LINE
EIA STUDY REPORT

APPENDICES

APPENDIX A

GUIDELINES FOR AN ENVIRONMENTAL IMPACT ASSESSMENT OF A 345 kV TRANSMISSION LINE FROM SALISBURY TO BATHURST/BELLEDUNE

GUIDELINES FOR AN ENVIRONMENTAL IMPACT ASSESSMENT OF

A 345 kV TRANSMISSION LINE FROM

SALISBURY TO BATHURST/BELLEDUNE

ISSUED BY THE MINISTER OF
THE ENVIRONMENT FOR THE
PROVINCE OF NEW BRUNSWICK

to

THE NEW BRUNSWICK ELECTRIC POWER COMMISSION

February 9, 1990

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GUIDELINES FOR AN ENVIRONMENTAL IMPACT ASSESSMENT OF A 345 kV TRANSMISSION LINE FROM SALISBURY TO BATHURST/BELLEDUNE

1.0 INTRODUCTION

The purpose of this document is to provide guidance to the New Brunswick Electric Power Commission (NB Power) relating to the substance, scope, and conduct of an Environmental Impact Assessment (EIA) of a proposal by NB Power to construct and operate a 345 kV transmission line from Salisbury to Bathurst/Belledune.

When an EIA has been prepared by NB Power, it will be submitted for review. A technical analysis of the EIA will be carried out by a Review Committee of technical experts from various Provincial and Federal agencies.

Once it is determined that the EIA Report adequately meets the guidelines, the Report will be made public. Public meetings respecting the EIA will be held in areas potentially affected, prior to a government decision on this proposal.

Environmental impact assessment review procedures are specified in Regulation 87-83, the Environmental Impact Assessment Regulation - Clean Environment Act. A summary of these procedures and more detailed information on the EIA process is contained in the publication entitled "Environmental Impact Assessment in New Brunswick", which is available from offices of the Department of the Environment.

2.0 CONDUCT OF EIA AND REPORT PREPARATION

2.1 General

These guidelines should provide focus and direction for the conduct of the EIA. The purpose is not to specify a rigid framework for the EIA or its component studies. Rather, NB Power is expected to develop appropriate methods for predicting environmental impacts and responding to the information requests identified herein.

2.2 Methodological Approach to Environmental Impact Assessment

Although a detailed methodology will not be prescribed for this environmental impact study, it is strongly recommended that NB Power, in developing its procedure, consult with the EIA Review Committee, appropriate government agencies, and appropriate scientific and technical authorities. Documentation of these consultations should be available for review by the Committee. It is the responsibility of the proponent to ensure that the chosen methodology is tenable, scientifically and logically.

Beanlands and Duinker (1983) recommended that a number of basic requirements be adopted for the organization and execution of environmental impact assessments. These elements are now considered essential for the successful design and completion of an EIA.

Identification of Valued Environmental Components

To provide a focus for the EIA, ecosystem components which are potentially at risk and which are considered of significant value must be identified. This value is based not only upon **scientific or economic judgements, but also upon subjective social values and public perceptions.** The study should focus on the potential effects of the undertaking on those components which are specified in Section 4.0 of this document.

Definition of a Context for Impact Significance

Prior to the study of the project's potential impact on each valued environmental component, **objective criteria for determination of the importance of this impact** must be generated. These measures of environmental consequences should be developed through consultation with the relevant stakeholders, such as government reviewers and public interest groups. **A clear definition of terms** should accompany those used to describe impact significance to enhance interpretation of the report.

Establishment of Study Boundaries

The way in which environmental assessments are conducted is determined by several factors, including the administrative framework within which the EIA takes place, the variability of natural systems, and the physical extent of the proposed undertaking. These factors represent boundaries within which impact assessment studies must take place. In some cases these factors impose limitations on the ability to obtain information.

For example, the duration of the construction period establishes a temporal boundary. The physical extent of the site establishes a spatial limit of the undertaking. Also, technical constraints could include undertaking difficult sampling programs for some species.

It is important that the boundaries for component studies of this environmental assessment be established as a part of the process of developing the EIA. Such boundaries are critical to study design, the interpretation of results, the prediction of impacts, and the determination of impact significance.

Boundaries which determine the context of the EIA and component studies should be stated explicitly in the EIA Report.

Development of a Study Strategy

Development of an explicit strategy for the EIA serves to direct a general concern over a valued ecosystem component into specific questions for detailed study and then to coordinate those studies. Thus, the strategy development progresses from a conceptualization of the project and its environment, through an analysis of their interactions, to tactical decisions regarding study options.

Prediction of Environmental Effects

The main focus of the environmental impact assessment should be to predict changes to the environmental components identified in Sections 3.0 and 4.0 which may result from the undertaking. **Predictions should consider all aspects and phases of the project, and any secondary, cumulative or synergistic effects.**

Predictions should be made regarding the nature, magnitude, duration and distribution of the project's environmental effects. These predictions must:

1. Facilitate decision-making with respect to the proposed project.
2. Clearly specify the **degree of uncertainty** inherent in the projections.
3. Be amenable to testing through ongoing monitoring.

Detail should be provided on the basis for the predictions and the circumstances under which the predictions would not be valid.

Predictions may be made based on experimental evidence, modelling or expert judgement. Expert judgements should be made by accountable individuals and based on well- documented scientific evidence. Objective evaluations are strongly preferred. Subjective judgements may be necessary due to administrative or technical constraints. The **confidence level and the limitations of the analysis should be clearly stated** when presenting the conclusions from either methodology.

Monitoring, Mitigation, and Compensation

The EIA should describe how potential environmental impacts may be mitigated or prevented from occurring, or how existing uses of the land can be maximized. In instances where more than one mitigation measure could be applied, the relative merits of each, and the reasons for selecting a particular method should be discussed.

A commitment to monitoring should be made in the EIA. Monitoring programs capable of providing information to test impact predictions and to evaluate the effectiveness of measures implemented to mitigate environmental impacts or enhance existing uses should be detailed.

In instances where predictive analysis lacks a quantitative basis, it is expected that monitoring will be capable of addressing information deficiencies.

NB Power is strongly encouraged to consult with regulatory agencies throughout the assessment process in developing monitoring programs for the undertaking. Monitoring programs may be wholly or partly the responsibility of NB Power or other government agencies. The EIA should outline NB Power's intentions with regard to complimentary or cooperative monitoring programs.

Where appropriate, compensation measures should be presented as an alternative to mitigation. NB Power should consult with government and potentially affected individuals and/or groups in determining the appropriateness and nature of compensation.

2.3 Public Consultation

NB Power will consult with **those potentially affected** by the transmission line during the course of the EIA and should **incorporate their concerns into the EIA.** In particular, NB Power should hold public information sessions in at least 5 different communities along the proposed right-of-way to familiarize the public with the proposed route as well as with the issues associated with the project and then to incorporate their feedback as part of the study.

2.4 Terms of Reference

NB Power is required to submit terms of reference in response to the EIA guidelines. These should describe the methods proposed for carrying out the EIA, and the means by which NB Power will consult with the public during the conduct of the EIA.

The terms of reference will be examined by the Review Committee, and comments may be provided to the proponent. The proponent is strongly urged to consider any remarks about the terms of reference which may come from the Review Committee.

3.0 DESCRIPTION OF THE PROJECT AND THE EXISTING ENVIRONMENT

3.1 Project Description

The EIA report should clearly describe, in detail, all aspects of the project including the construction and maintenance of the transmission line as well as its physical and expected electromagnetic characteristics when in service.

3.1.1 Physical Description

The transmission line components such as the line itself, the towers, and pads should be described as well as any new structures, such as terminals, junctions, or substations, associated with the proposal.

The EIA Report should accurately show the proposed route for the line (i.e. the location of the right-of-way) within the study area which will be proposed by NB Power as part of the study. This would include current land use and ownership, the location of structures, water crossings and their corresponding setbacks, cleared areas, any proposed temporary or permanent roads, any proposed camps necessary during construction, and any components identified in Section 4.0.

This description should include data on expected electrical, electrostatic, and magnetic fields which will be generated at peak load by-the transmission line and its associated structures both at ground level directly beneath the line as well as at the edge of the proposed right-of-ways.

This description should include data on expected audible noise and expected ozone concentrations at ground level at the edge of the right-of-way boundaries.

3.1.2 Land Rights

The form of land tenure arrangements or easements that can and are to be reached between NB Power and the Province of New Brunswick or other landowners should be described in detail. Terms of usage should be clearly stated.

3.1.3 Construction Activities

Construction methods for all phases of the work should be described along with a proposed schedule for the work. This description should indicate which work will be contracted out.

Methods and equipment used for erecting towers and lines, for crossing rivers and other obstacles, and for clearing the right-of-way and any access roads should be described.

The EIA Report should state plans for surface restoration after construction and for the disposal of construction excavation debris and wastes.

The EIA Report should outline what pesticides or herbicides will be used, if any, in the construction of the right-of-way, including quantities, methods of application and effects.

Planned supervision and inspection practices for environmental effects and related controls or training for environmental protection during construction should be detailed, including when work is subcontracted.

3.1.4 Maintenance Activities

Maintenance activities should be described along with a proposed schedule for the work. This description should indicate which work will be contracted out.

Methods and equipment used for clearing the right-of-way should be described. The EIA Report should outline what pesticides and herbicides will be used, if any, including quantities, methods of application and effects. Contrast chemical versus non-chemical controls. Describe the changes, if any, in local plant species and vegetation that will result from these practices.

Planned supervision and inspection practices for environmental effects and related controls or training for environmental protection during maintenance should be detailed, including when work is subcontracted.

3.2 Project Rationale

NB Power should present, clearly and concisely, **the need for this transmission line, in whole or in part**. If the project rationale is tied in part to either increased supply or demand, these links should be explicitely stated. Demand should be broken down into domestic and foreign market segments. The EIA Report should specify if the forecasted supply is tied to the completion of any proposed electrical generating stations and on the importation of electricity into New Brunswick. In presenting its rationale for the proposed right-of-way, NB Power should indicate how this corridor will meet requirements for any projected future transmission.

3.2.1 Rationale for Width of Right-Of-Way

NB Power should present a rationale for the proposed width of the transmission line right-of-way. NB Power could suggest alternative widths for the right-of-way based on financial, health and safety, construction and maintenance, environmental protection or economic concerns.

3.3 Alternatives to the Proposal

It is expected that NB Power will clearly show how it has developed the concept being proposed. **Specifically, NB Power should demonstrate that it has considered the consequences of not proceeding with the construction of the transmission line, in whole or in part.** NB Power should consider the alternatives of upgrading existing lines as well as the additional use of existing transmission corridors.

It should demonstrate that it has considered the possibility of a variable width right-of-way along the proposed routes to accomodate setbacks appropriate to varying valued environmental components as they are encountered.

3.4 Identification and Analysis of Alternative Routes

The criteria used to select the study area for the proposed transmission line should be detailed.

NB Power will select a proposed route as well as alternative routes from within the study area. NB Power should demonstrate that they have carefully evaluated operational, environmental, social, and economic factors in delineating routes.

The criteria used to select alternative routes should be stated. An objective analysis should be provided for the determination of the importance of each valued environmental component as well as for any other criteria considered by NB Power in its alternative route analysis.

The relative merits of each route should-be compared and contrasted from the perspective of environmental, social, and economic constraints.

3.5 Description of the Existing Environment

Section 31.1(1) of the Clean Environment Act, defines "environment" as:

(a) air, water, or soil

(b) plant and animal life including human life, and

(c) the social, economic, cultural and aesthetic conditions that influence the life of humans or a community insofar as they are related to the matters described in (a) and (b).

In the EIA Report, NB Power should describe the environment along the proposed route and alternative routes to provide the reader with a basic understanding of the potential interactions with the proposed project.

Current land uses should be documented including commercial forestry operations, commercial agricultural operations and recreational land. Current and forecasted land use of local communities near the proposed route should be documented as a basis for predicting potential impacts from construction and operation of the transmission line.

The report should identify actual or potential **ecological reserves and any rare or endangered species, features or habitat** as well as any recognized unique or significant habitat (such as unique plant assemblages or valued local landmarks) that may be affected by the construction, maintenance or presence of the transmission line.

As well, a description of the environmental components identified in Section 4.0 must be provided for the proposed route, as a basis for predicting environmental change, and as a baseline for subsequent monitoring of impacts.

4.0 VALUED ENVIRONMENTAL COMPONENTS

The environmental impact assessment conducted by the New Brunswick Electric Power Corporation should focus on the following specific issues, predicting their impacts and proposing mitigation measures where appropriate:

4.1 Predict impacts of the proposed undertaking on existing land users and owners.

Include impacts to private and commercial users of the land (e.g. agricultural, forest harvesting, outfitting, trapping) from increased ease of access to the general population for recreational uses of the land, such as: sport fishing; hunting; recreational trapping; snowmobiling; skiing; canoeing; camping. Consider impacts to other affected land users such as airports, provincial and federal parks, etc. Outline potential positive or compatible uses of the right-of-way (for example on Crown Land, clearing cross-country ski trails, encouraging blueberry farming, etc.).

4.2 Predict impacts on recreational use of the areas affected.

Include impacts to current recreational users from the construction and operation of the transmission line. Evaluate visual impacts from the transmission line on recreational usage of the affected areas.

4.3 Predict the impact of the proposed undertaking on human health and safety.

Focus on the physical well-being of citizens who live or work near the proposed routes. Evaluate the risks to humans associated with long term exposure to transmission line effects, particularly from electromagnetic fields.

4.4 Predict the impacts of this proposal on forest resource harvesting.

Predict impacts on forest harvesting opportunities.

4.5 Predict impacts on wildlife and avian wildlife species and their supporting habitats.

Examine impacts on species which are sensitive to the changes in habitat caused by the construction and maintenance of the line or by the presence of the cleared right-of-way. Evaluate effects on bird habitat management programs.

4.6 Predict impacts on endangered species and their supporting habitats.

Examine impacts on endangered species sensitive to the changes in habitat caused by the construction and maintenance of the line or by the presence of the cleared right-of-way and of the transmission line itself.

4.7 Predict the impact on the fisheries resource and its supporting habitats

Examine impacts from fording streams and rivers and from clearing vegetation on fish and their spawning beds of species of recognized importance. Examine impacts on fish and fish habitat from fishing and recreational pressures arising from increased ease of access to isolated areas.

4.8 Predict impacts on water and air quality.

Examine impacts from fording streams and rivers by erosion and siltation. Include an evaluation of impacts on current and future surface watersheds used for municipal domestic water supplies.

4.9 Predict the impact of the construction and operation of a transmission line on communities bordering the right-of-way.

Predict impacts with existing and future expansion of municipalities. Consider the effects of the transmission line on future development near the transmission line.

4.10 Predict the impact of the proposed undertaking on private, Crown and freehold land values.

Predict impacts on land values along the proposed routes. Consider the effects of the transmission line on the value of property near the transmission line.

4.11 Predict impacts on commercial agricultural activities.

Predict impacts on commercial agricultural activity from potential disease, weed and pest transmission from construction and maintenance of the cleared right-of-way. Assess potential impacts from loss of agricultural land and from soil erosion.

Evaluate impacts to commercial blueberry operations along proposed routes.

4.12 Predict the impact of the proposed undertaking on present and future potential mineral extraction.

Determine impacts to quarrying operations along proposed routes. Assess impacts to existing and potential mineral operations and leases. Assess geologic potential for economic mineral deposits.

4.13 Predict the impact of the proposal on historical and archaeological resources.

Predict impacts from the construction and maintenance of the transmission line to identified and potential heritage sites.

4.14 Predict the impacts of the proposal on microwave and radio-electronic communications

Predict impacts to existing microwave communications because of presence of the transmission line.

Describe impacts to local and regional radio-electronic communications along the proposed transmission line routes.

5.0 REFERENCES CITED

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APPENDIX B
ROUTE SELECTION STUDY

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B.1 Biophysical Setting of Study Corridor

This Section describes the biophysical setting of eastern New Brunswick with specific reference to the study corridor as the basis for the Route Selection Study. The study corridor (Figure 1-2), which extends between Salisbury in the south and Bathurst and Belledune in the north, is described in detail. The description includes the physical setting (physiography, bedrock geology, surficial geology, soils, climate and hydrology) and the biological setting (vegetation, wildlife and fish). Specific details of the biophysical setting of proposed route are discussed in Chapter Four of the main report.

B.1.1 Physiography

The natural environment of the study corridor reflects the geology of eastern New Brunswick. The study corridor crosses or enters four physiographic regions in New Brunswick (Rampton, et al. 1984). These regions and their subdivisions are described below and depicted in Figure B-1.

The southern portion of the corridor commences in the northern portion of the Caledonian Highlands (Figure B-1). The Salisbury area lies within the Moncton Basin which is bordered on the north, west and south by the Anagance Ridges which are characterized by ridge and valley topography of relatively high relief. The Moncton Basin is considered to be a widening of one of the valleys of the Anagance Ridges, and is characterized by topography which is gently undulating and drainage which is moderately good.

The study corridor traverses the New Brunswick Lowlands west of its widest portion (Figure B-1). This physiographic region is a flat to gently sloping plain which slopes in an easterly direction. The Central Lowlands, which encompass most of the area south of the Miramichi River, are characterized by broad, flat, poorly drained areas and valleys which are poorly defined.

The study corridor crosses the narrow northern portion of the Eastern Miramichi Highlands subdivision of the extensive Miramichi Highlands (Figure B-1). This subdivision is a continuation of the gently rising plain of the adjacent New Brunswick Lowlands, and is a transition zone between the lowlands and the core of the highlands to the west. There are some major streams with deeply incised valleys. The West Bathurst Basin is situated on the west side of Bathurst Harbour and is included as part of the Miramichi Highlands.

b West Bathurst Basin

4 **CHALEUR UPLANDS**

a Chaleur Coastal Plain
b Jacquet Plateau

LÉGENDE

1 **HAUTS-PAYS CALÉDONIENS**

a Crêtes Anagance
b Bassin de Moncton

2 **PAYS-BAS DU NOUVEAU-BRUNSWICK**

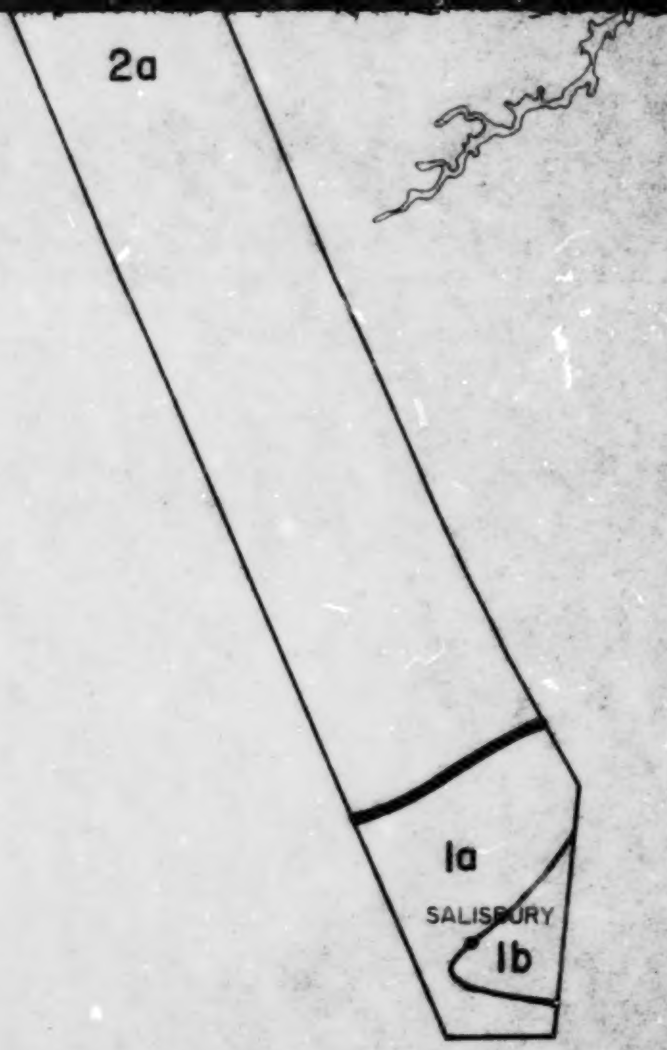
a Pays-bas central
b Vallée de Curventon-Bathurst
c Péninsule acadienne

3 **HAUTS-PAYS DE-LA MIRAMICHI**

a Haut-pays oriental de la Miramichi
b Bassin de Bathurst ouest

4 **HAUTS PLATEAUX DES CHALEURS**

a Plaine côtière des Chaleurs
b Plateau Jacquet



PHYSIOGRAPHIC REGIONS
RÉGIONS PHYSIOGRAPHIQUES

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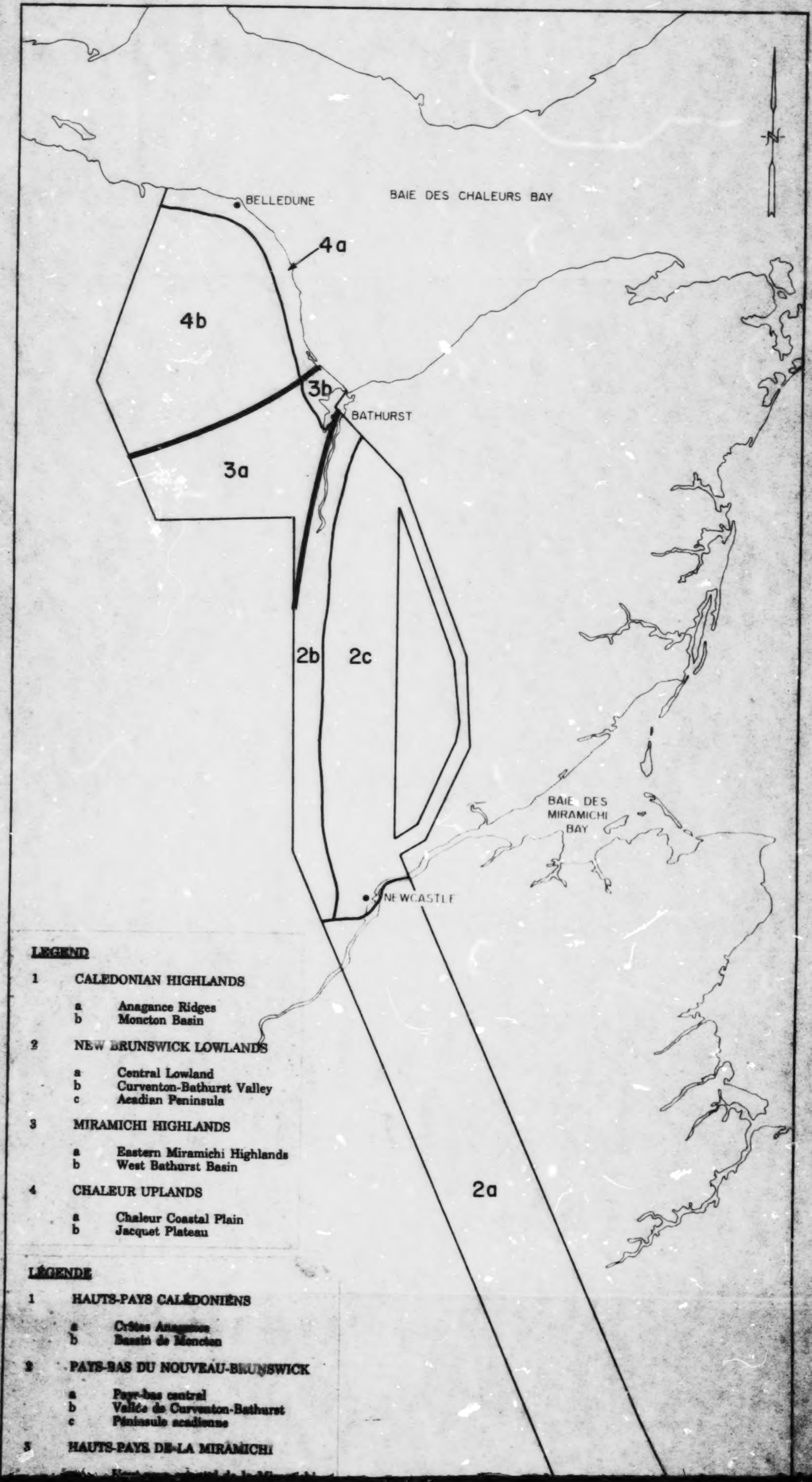

BELLEDUNE
BAIE DES CHALEURS BAY
4a
4b
3b
BATHURST
3a
2b
2c
BAIE DES MIRAMICHI BAY
NEWCASTLE
2a
N
LEGEND
1 CALEDONIAN HIGHLANDS
a Anagance Ridges
b Moncton Basin
2 NEW BRUNSWICK LOWLANDS
a Central Lowland
b Curventon-Bathurst Valley
c Acadian Peninsula
3 MIRAMICHI HIGHLANDS
a Eastern Miramichi Highlands
b West Bathurst Basin
4 CHALEUR UPLANDS
a Chaleur Coastal Plain
b Jacquet Plateau
LÉGENDE
1 HAUTS-PAYS CALÉDONIENS
a Crêtes Anagance
b Bassin de Moncton
2 PAYS-BAS DU NOUVEAU-BRUNSWICK
a Pays-bas central
b Vallée de Curventon-Bathurst
c Péninsule acadienne
3 HAUTS-PAYS DE LA MIRAMICHI

The study corridor terminates within the Jacquet Plateau subdivision of the Chaleur Uplands, which is a plateau locally dissected near major streams and interrupted by clusters of hills (Figure B-1). The Jacquet Plateau is an undulating and generally well-drained plateau which slopes to the north and east toward the Chaleur Coastal Plain. Streams lie within deeply incised, V-shaped valleys.

B.1.2 Bedrock Geology

The major portion of the study corridor (Figure B-2) passes over flat lying Carboniferous sedimentary bedrock of the Pennsylvanian and Mississippian periods within the Carboniferous Cover zone of New Brunswick. The Carboniferous sediments are weathered to a depth of several metres throughout much of the area, and have potential for gas and oil, coal, salt, gypsum, potash and silica sandstone. Coal deposits underlie the corridor near Harcourt. North of Newcastle, the corridor passes over a diabase dyke which bisects the Acadian Peninsula. This dyke is currently mined for high quality aggregates in the Allardville area.

The area west of Bathurst, including the Bathurst Mines area, is called the Miramichi Belt, and is a complex of older materials of the Devonian and Ordovician periods (Figure B-2). These older rocks have a relatively high mineral resource potential; the Brunswick Mining and Smelting No. 12 mine has large deposits of lead-zinc-silver-copper-gold sulphides.

A small region of Devonian granite and Ordovician sandstone, slate and volcanics is situated southwest of Belledune (Figure B-2). These deposits are referred to as the Elm Tree Inlier and are of high mineral potential.

B.1.3 Surficial Geology

The major Quaternary unit within the New Brunswick Lowlands (Figure B-1) is a blanket of till which ranges in thickness from less than 0.5 to 3.0 m (Figure B-3). The material is predominantly a brown to reddish brown silty sand till deposited directly by Late Wisconsinan ice or with minor reworking by water (Rampton, et al. 1984). Numerous boggy areas of Holocene age developed due to the poor drainage of the above-noted till and the numerous depressions.

The highland regions west of Bathurst are characterized by morainal sediments which are in the form of a veneer of till (Figure B-3). Drainage in this area is generally good, although there are some areas of poorly drained conditions. Within this region are small pockets of

LÉGENDE

TRIAS-JURASSIQUE

Tj Dyke de diabase

PENSYLVANIEN-PERMIEN

Ms Conglomérats et grès non marins déposés dans des bassins marins peu profonds

MISSISSIPPIEN

Ms Conglomérats et grès non marins déposes dans des bassins marins peu profonds

DÉVONIEN

Dg Granite et un peu de gabbro
Ds Grès, siltstone, schiste, de même qu'un peu de conglomérats et de calcaire déposés dans des bassins marins de peu profonds à profonds et des lits de rivières

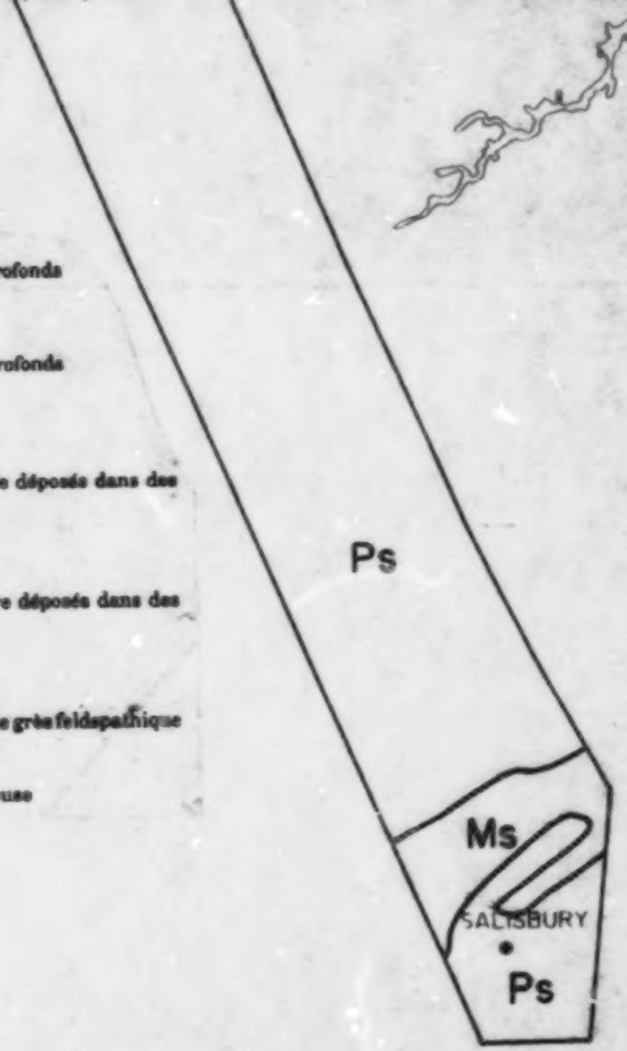
SILURIEN

Ss Grès, siltstone, schiste, de même qu'un peu de conglomérats et de calcaire déposés dans des bassins marins de peu profonds à profonds

ORDOVICIEN

Ov Sédiments volcaniques rhyolitiques et basaltiques, de formation ferreuse, de grès feldspathique et de schistes noirs déposés dans un environnement sous-marin profond

Os Grès et ardoise quartzite déposés dans un bassin marin dont le lit se creuse



BEDROCK GEOLOGY
GÉOLOGIE DE LA ROCHE
EN PLACE

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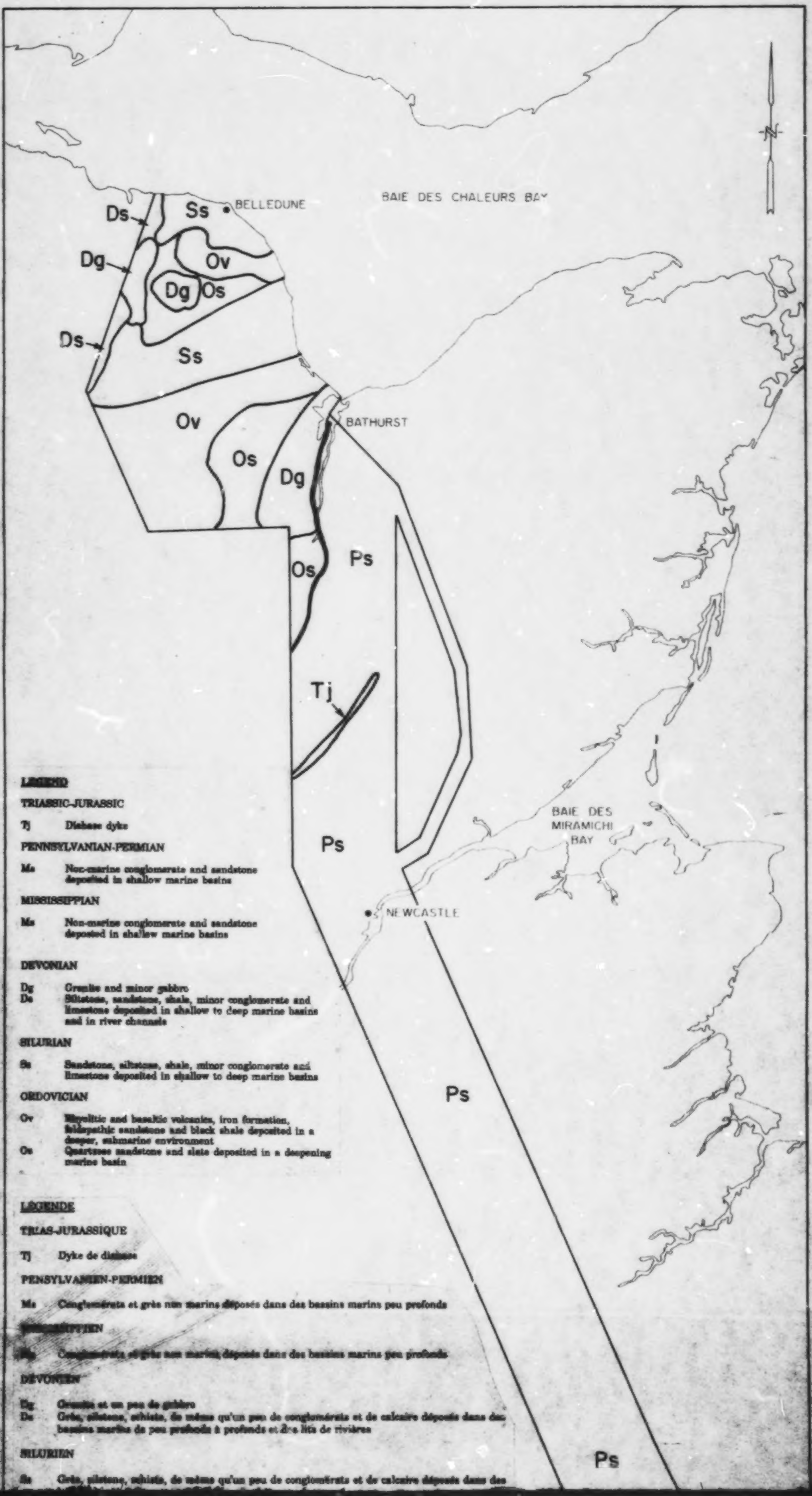


LEGEND

TRIASSIC-JURASSIC

Tj Diabase dyke

PENNSYLVANIAN-PERMIAN

Ms Non-marine conglomerate and sandstone deposited in shallow marine basins

MISSISSIPPIAN

Ms Non-marine conglomerate and sandstone deposted in shallow marine basins

DEVONIAN

Dg Granite and minor gabbro

Ds Siltstone, sandstone, shale, minor conglomerate and limestone deposited in shallow to deep marine basins and in river channels

SILURIAN

Ss Sandstone, siltstone, shale, minor conglomerate and limestone deposited in shallow to deep marine basins

ORDOVICIAN

Ov Rhyolitic and basaltic volcanics, iron formation, feldspathic sandstone and black shale deposited in a deeper, submarine environment

Os Quartzose sandstone and slate deposited in a deepening marine basin

LÉGENDE

TRIAS-JURASSIQUE

Tj Dyke de diabase

PENSYLVANIEN-PERMIEN

Ms Conglomérats et grès non marins déposés dans des bassins marins peu profonds

MISSISSIPPIEN

Ms Conglomérats et grès non marins déposés dans des bassins marins peu profonds

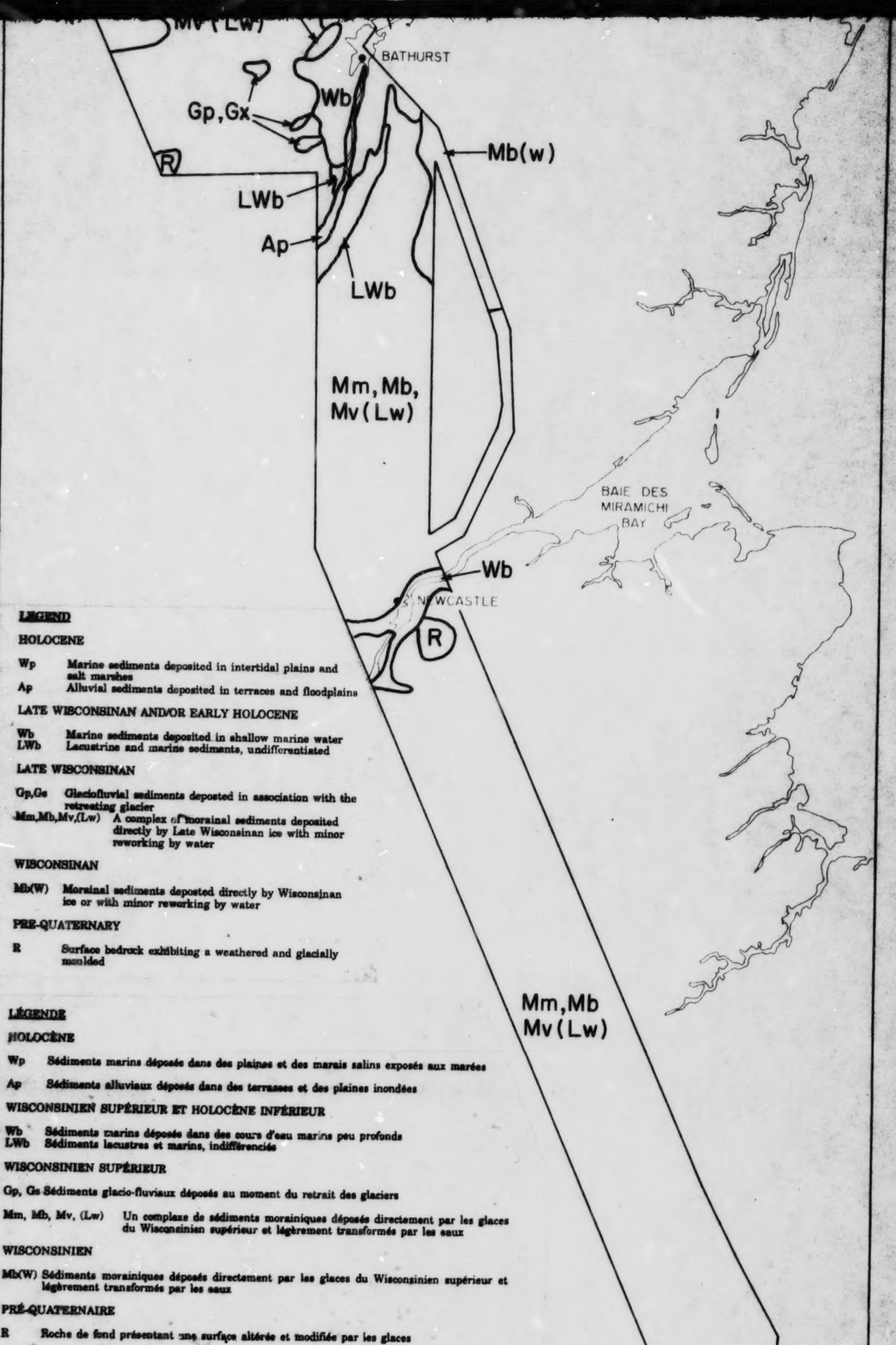
DÉVONIEN

Dg Granite et un peu de gabbro

Ds Grès, siltstone, schiste, de même qu'un peu de conglomérats et de calcaire déposés dans des bassins marins de peu profonds à profonds et dans lits de rivières

SILURIEN

Ss Grès, siltstone, schiste, de même qu'un peu de conglomérats et de calcaire déposés dans des



LEGEND

HOLOCENE

Wp	Marine sediments deposited in intertidal plains and salt marshes
Ap	Alluvial sediments deposited in terraces and floodplains

LATE WISCONSINAN AND/OR EARLY HOLOCENE

Wb	Marine sediments deposited in shallow marine water
LWb	Lacustrine and marine sediments, undifferentiated

LATE WISCONSINAN

Gp,Gs	Glaciofluvial sediments deposted in association with the retreating glacier
Mm,Mb,Mv,(Lw)	A complex of morainal sediments deposited directly by Late Wisconsinan ice with minor reworking by water

WISCONSINAN

Mb(W)	Morainal sediments deposted directly by Wisconsinan ice or with minor reworking by water

PRE-QUATERNARY

R	Surface bedrock exhibiting a weathered and glacially moulded

LÉGENDE

HOLOCÈNE

Wp	Sédiments marins déposés dans des plaines et des marais salins exposés aux marées
Ap	Sédiments alluviaux déposés dans des terrasses et des plaines inondées

WISCONSINIEN SUPÉRIEUR ET HOLOCÈNE INFÉRIEUR

Wb	Sédiments marins déposés dans des cours d'eau marins peu profonds
LWb	Sédiments lacustres et marins, indifférenciés

WISCONSINIEN SUPÉRIEUR

Gp, Gs	Sédiments glacio-fluviaux déposés au moment du retrait des glaciers
Mm, Mb, Mv, (Lw)	Un complaxe de sédiments morainiques déposés directement par les glaces du Wisconsinien supérieur et légèrement transformés par les eaux

WISCONSINIEN

Mb(W)	Sédiments morainiques déposés directement par les glaces du Wisconsinien supérieur et légèrement transformés par les eaux

PRÉ-QUATERNAIRE

R	Roche de fond présentant une surface altérée et modifiée par les glaces

SURFICAL GEOLOGY
GÉOLOGIE DES DÉPÔTS MEUBLES

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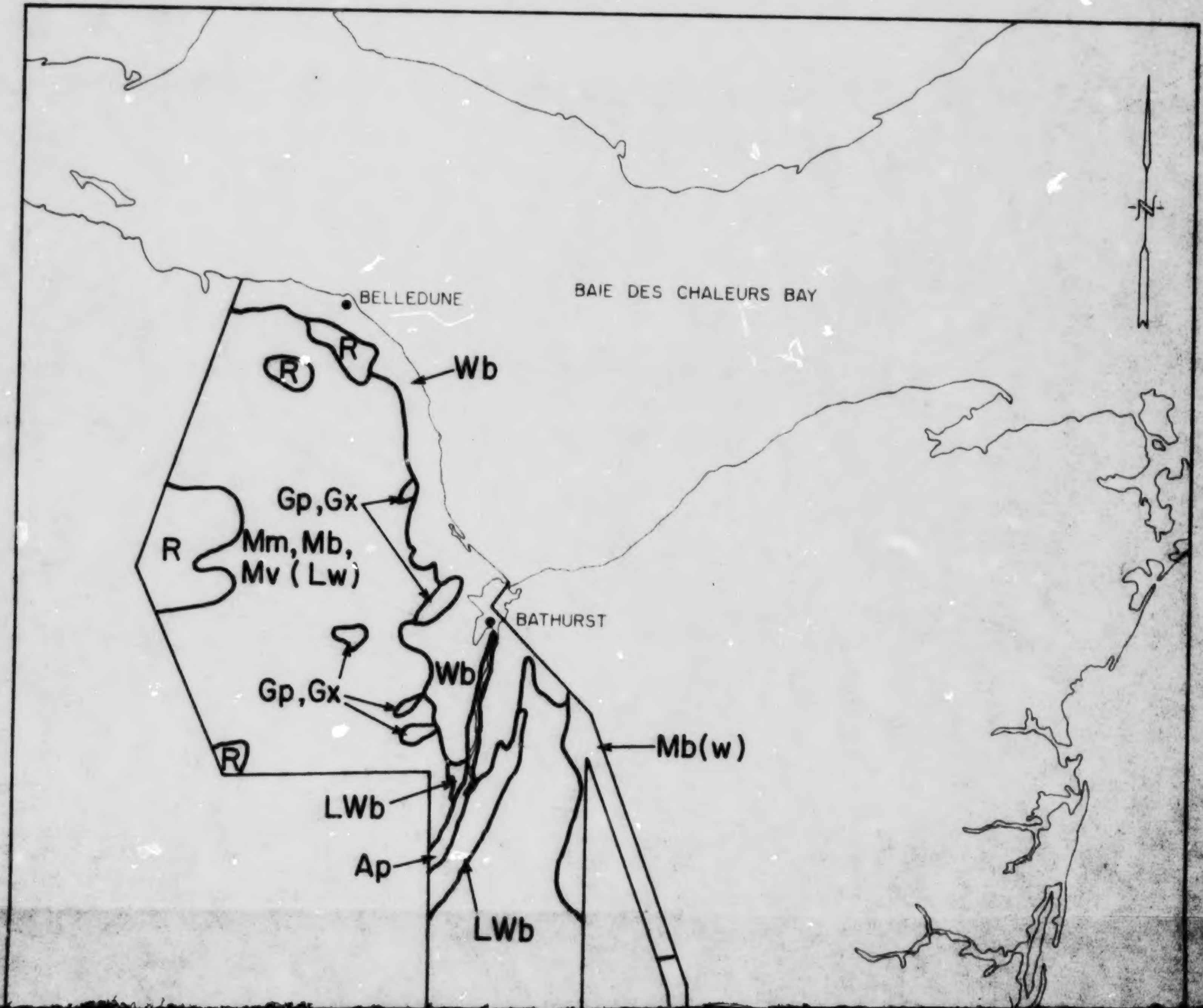

N
BELLEDUNE
BAIE DES CHALEURS BAY
R
R
Wb
Gp,Gx
R
Mm, Mb,
Mv (Lw)
BATHURST
Gp,Gx
Wb
R
Mb(w)
LWb
Ap
LWb

glaciofluvial sand and gravels which were deposited in association with the retreating glacier. These have potential for aggregates.

B.1.4 Climate

Van Groenewoud (1984) divided New Brunswick into 11 climatic regions on the basis of multivariate statistical analyses of data on precipitation, temperature, elevation, latitude, and longitude for 76 climatological stations. The corridor is primarily within climatic regions 3 (Kent and Westmorland Counties), 6 (Northumberland and eastern Gloucester Counties) and 10 (western Gloucester and northern Restigouche Counties).

The southern portion of the study area has a continental climate characterized by cool, damp springs due to the prevailing winds from the Gulf of St. Lawrence. The mean annual temperature is 5°C; the mean temperature for July, the hottest month, is 18.9°C, and for January, the coldest month, -10.5°C inland (Environment Canada 1982). The average rainfall from May to September is 40.6 cm inland and 35.6 cm along the coast. The average annual precipitation ranges from 101.6 cm inland to 91.4 cm along the coast. The frost-free period is about 130 days on the coast and 108 days inland. The area has about 2,500 to 2,700 growing degree days.

The northern portion of the study area is continental inland and maritime along the coast (Environment Canada 1982). The average summer rainfall is 35.6 to 40.6 cm, the mean annual temperature is 3.9°C, and the mean frost-free period is 100 days inland and 130 days on the coast. January, the coldest month, has a mean temperature of -10°C on the coast and -13.3°C in the western highlands; July, the hottest month, has a mean temperature throughout of 18.9°C. Coastal areas are moderated by winds from the Bay of Chaleur. The number of degree-days above 5.5°C range from 2,500 in the lowlands to 2,250 in the higher western regions.

Winter weather conditions are highly variable across New Brunswick. In comparing available climatic data for the weather stations along the corridor (Environment Canada 1982), it appears that winter weather severity is greater at the south and north stations (Moncton and Belledune). Temperatures have been lowest in Harcourt, Bathurst and Belledune based on these data. Moncton and Belledune indicate the most snow, and Moncton and Chatham have had the most days with snow during the winter months (November to April). Bathurst has had both the least amount of snow and the fewest days with snow recorded for the stations along the study corridor. For example, mean snow depth at the end February at Bathurst for the period of record was 54.5 cm, while the snow depth at Moncton at the end of February was 60.4 cm. Mean snow depths at Bathurst were less than 60 cm (with the exception of January at 63.8 cm) while all other stations had depths greater than 60 cm during January, February and March. The greatest mean snow depth was recorded at Moncton, with 77.8 cm falling during January.

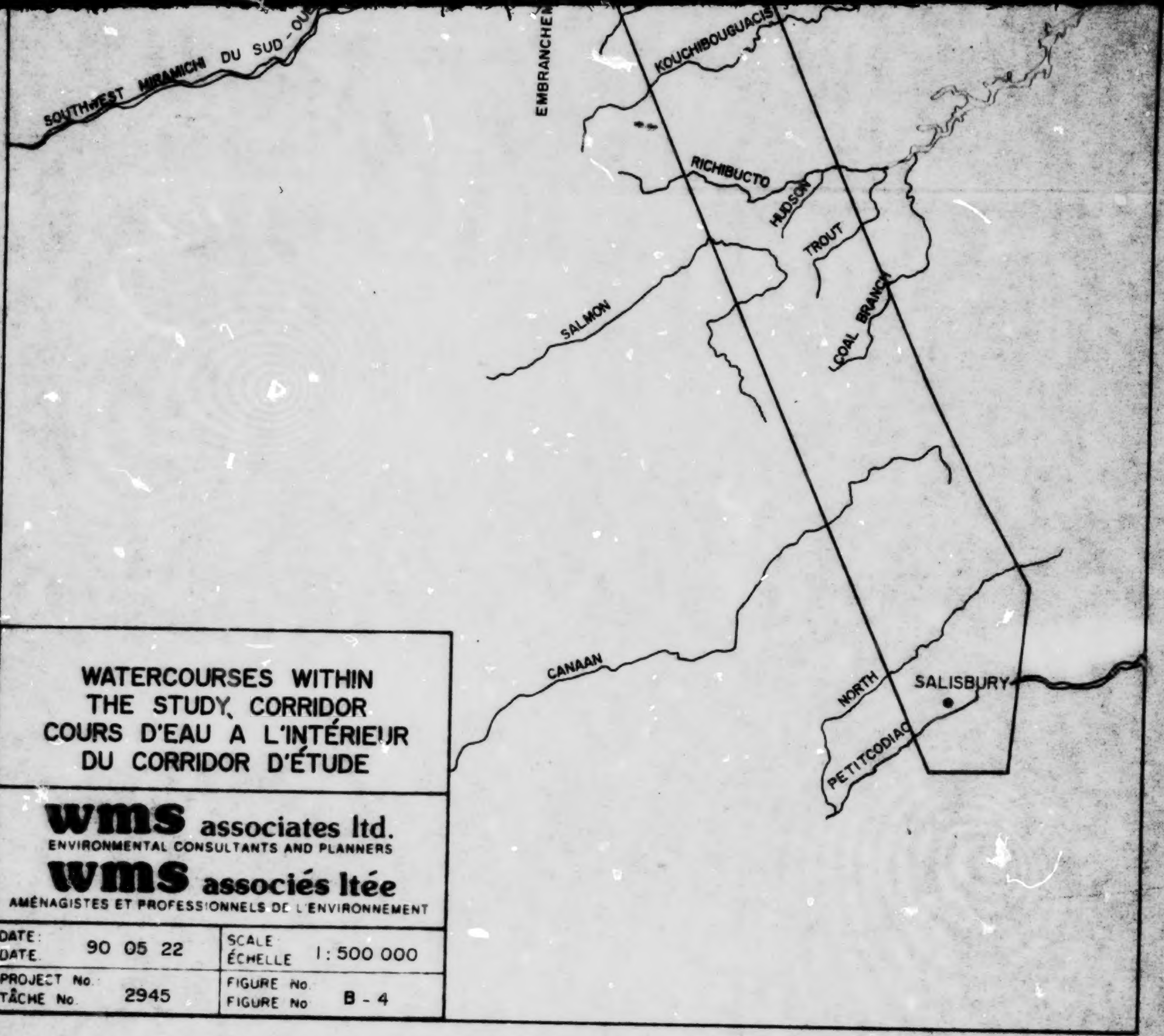
B.1.5 Hydrology

B.1.5.1 River Systems

The study area is drained by three major and numerous smaller rivers (Figure B-4). The direction of flow is mostly east in the southern portion of the study area, and north in the northern portion, with a few exceptions.

The major river system in the south is the Petitcodiac River which flows eastward through the Village of Salisbury and the City of Moncton on its way to the Bay of Fundy (Figure B-4). North of the Petitcodiac is the North River which flows southwestwards to join the Petitcodiac River at Petitcodiac. The region west of Gallagher Ridge and Canaan is drained by the Canaan River and tributaries which flow southwestwards to the Saint John River. Numerous streams which drain the Birch Ridge-Adamsville-Harcourt area flow in a general northeasterly direction and combine to form the Richibucto River which enters Northumberland Strait near Richibucto. The main tributaries are Coal Branch River, Trout Brook and Hudson Brook. The region west of this area is drained by the northerly then southwesterly flowing Salmon River which joins the Saint John River system at Grand Lake. The region between Kent Junction and Acadia Siding is drained by the Kouchibouguacis and Kouchibouguac Rivers, which flow in an easterly direction to the Northumberland Strait.

The second major river system of the study area is the Miramichi River and its two tributaries, the Northwest and Southwest Miramichi Rivers; within the study area these rivers are northeasterly flowing (Figure B-4). The Southwest Miramichi River drains a vast area to the southwest, and includes the Barnaby River and its tributaries. The region from Rogersville to the Southwest Miramichi River is drained by the northward flowing Barnaby River and its tributaries; it joins the Southwest Miramichi River at Kirkwood. The Northwest Miramichi River drains the area to the north and includes the southward flowing tributaries East Branch Portage River and Northwest Millstream River. The eastern portion of the study area between Chatham and Allardville is drained by a series of eastward flowing streams, including Bartibog


SOUTHWEST MIRAMICHI DU SUD-OU
EMBRANCHEM
KOUCHIBOUGUACIS
RICHIBUCTO
HUDSON
TROUT
SALMON
COAL BRANCH
CANAAN
NORTH
SALISBURY
PETITCODIAC

WATERCOURSES WITHIN THE STUDY CORRIDOR
COURS D'EAU À L'INTÉRIEUR DU CORRIDOR D'ÉTUDE

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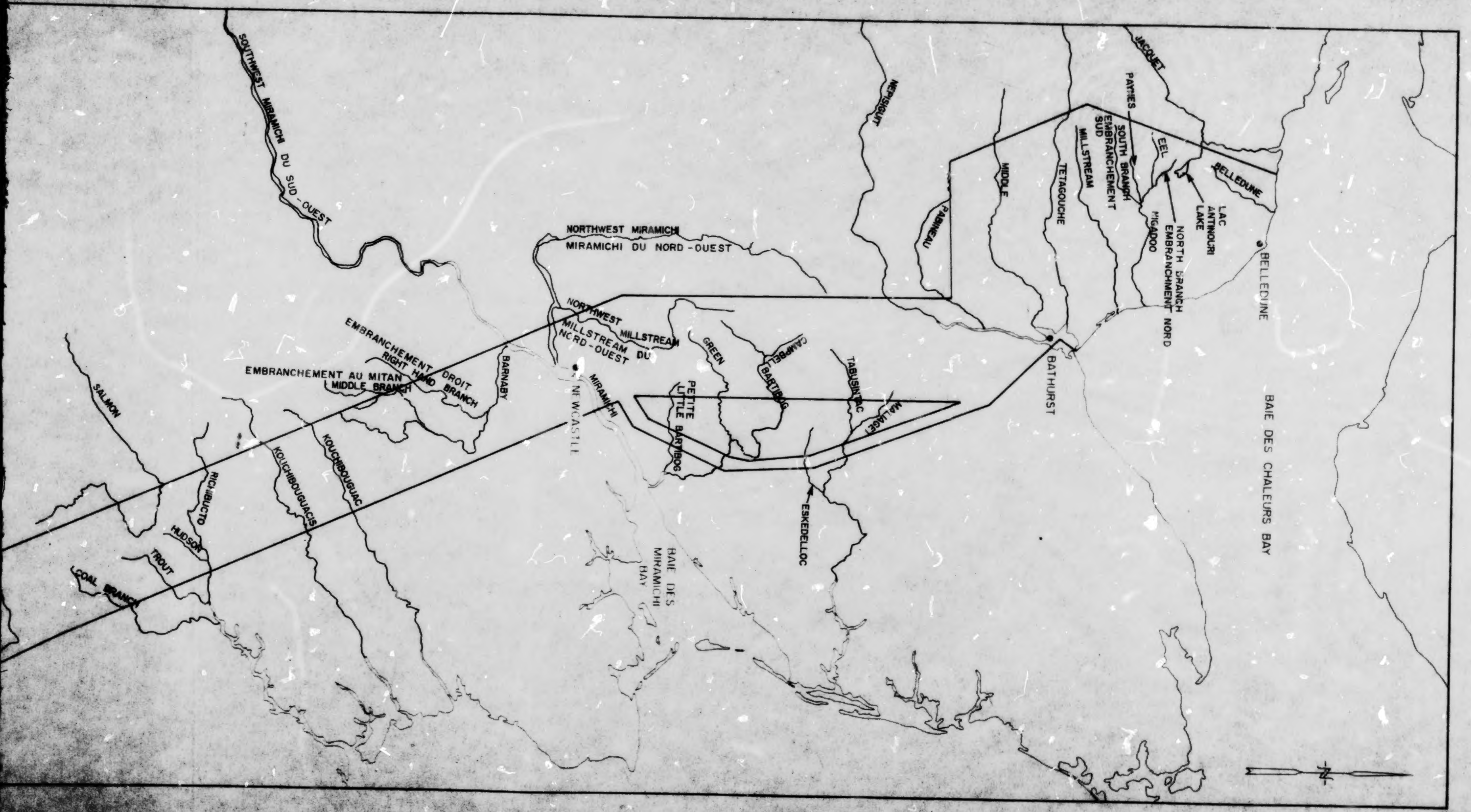

SOUTHWEST MIRAMICHI
MIRAMICHI DU SUD-OUEST
NEPISIGUIT
JACQUET
PAYNES
SOUTH BRANCH
EMBRANCHEMENT SUD
EEL
MILLSTREAM
TETAGOUCHE
MIDDLE
PABINEAU
BELLEDUNE
LAC ANTINOURI LAKE
NORTH BRANCH
EMBRANCHEMENT NORD
MIGADOO
BELLEDUNE
NORTHWEST MIRAMICHI
MIRAMICHI DU NORD-OUEST
NORTHWEST MILLSTREAM
MILLSTREAM DU NORD-OUEST
GREEN
CAMPBELL
BARTIBOG
TABUSINTAC
MALIGET
PETITE LITTLE BARTIBOG
BATHURST
BAIE DES CHALEURS BAY
EMBRANCHEMENT DROIT
RIGHT HAND BRANCH
EMBRANCHEMENT AU MITAN
MIDDLE BRANCH
BARNABY
NEWCASTLE
MIRAMICHI
SALMON
RICHIBUCTO
HUDSON
TROUT
COAL BRANCH
KOUCHIBOUGUACIS
KOUCHIBOUGUAC
ESKEDELLOC
BAIE DES MIRAMICHI BAY
N

River, Green Brook and Little Bartibog River of the Bartibog River system; and Escedelloc River, Maliaget Brook and other tributaries of the Tabusintac River system.

The third major river system draining the study area is the northward flowing Nepisiguit River which, together with its Pabineau River tributary, drains the region south of Bathurst (Figure B-4). The Nepisiguit, together with eastward flowing rivers, Middle, Little and Tetagouche, drains the region west of Bathurst and flow into Bathurst Harbour on Nepisiguit Bay, which is a section of Chaleur Bay. The region north of Bathurst is drained by a series of eastward flowing rivers which also flow into Nepisiguit Bay; these include Millstream River, Nigadoo River and its tributaries, and others further north. Finally, Belledune River is a northward flowing river which joins Chaleur Bay at Belledune River.

B.1.5.2 Groundwater Resources

The hydrogeology of the New Brunswick lowlands is dominated by the Pennsylvanian or younger rocks of the Carboniferous basin which underlie the corridor between Salisbury and Bathurst. These rock units are characterized by a sequence of horizontal beds which alternate frequently in the vertical plane and are of limited lateral extent. The rapid alternation of rock units both vertically and laterally within the bedrock greatly affects the occurrence and transmission of groundwater.

The groundwater development potential in the Pennsylvanian or younger rocks in the New Brunswick Lowlands is reported to be good (NBDOE 1984). Well yields are variable since aquifer boundaries are sometimes controlled by nearby impervious barriers and by surface recharge (NBDOE 1984). About 25 to 35 percent of wells developed in this unit have yields of greater than 0.8 to 0.5 L/s. Wells constructed for municipal supplies frequently yield up to 15 L/s. Water quality is generally good in the Pennsylvanian or younger rocks.

Groundwater is generally of excellent quality in the Bathurst region (NBDOE 1979). Water is soft, with a hardness of less than 80 mg/L. Peat, fluoride, salt, iron and manganese are the major factors which reduce water quality. Contaminants, especially in the Acadian Peninsula, tend to infiltrate quickly into the bedrock aquifers due to the relatively thin overburden (1 to 2 m) (NBDOE 1979).

The area between Bathurst and Belledune is geologically complex and is situated west of the extensive Pennsylvanian deposits of the New Brunswick Lowlands (NBDOE 1979). The bedrock is a complex igneous, metamorphic and sedimentary rocks of Devonian, Silurian and Ordovician ages. Overburden deposits typically are very shallow. Groundwater occurrence is limited to fractures and joints within the rock. Yields from wells in such areas are often less than 5 L/s, not enough to support high capacity wells.

Yields and water quality are lower in the Mississippian/Pennsylvanian conglomerates south of Bathurst. Locally extensive sands and gravels associated with the Pabineau Lake and Blue Mountain complex represent important groundwater reserves (NBDOE 1979). Overburden deposits associated with ancient river valleys in the Bathurst area can be as much as 60 m in depth.

The surficial geology of the corridor is characterized by extensive/glacial sediments which are dominated by sandy till. There are also other, less extensive deposits of poorly-sorted and stony till. While tills are generally less than 3 m in thickness, they can be locally important for low-yield wells as a source for shallow groundwater. This is particularly true for the sandy tills but would also be true for any till unit. Their ability to produce high yield wells would be limited both by their permeability and their vertical extent.

Although little is known about the hydrogeology of most of the study corridor, recharge of deep groundwater aquifers normally occurs over higher ground, while discharge will take place at low elevations. Discharge areas are generally recognized by the presence of springs, swamps and wet areas. Precipitation falling on the higher land areas will percolate downwards through the sandy soils to the deep groundwater table. Deep groundwater flow will then take place from beneath these areas of recharge towards areas of lower groundwater level. Recharge of precipitation will also occur along the path of flow.

Shallow groundwater aquifers in tills and other surficial deposits can be recharged by precipitation, shallow groundwater flow to low areas, or from deep groundwater flow beneath them.

Three areas of deep groundwater flow are expected to occur. Local flow systems which receive recharge over local high points discharge to nearby rivers, streams and wet areas. Intermediate flow systems which receive recharge generally to the west of the study corridor may discharge to low areas such as major rivers, at some distance from the point of recharge. Regional flow systems will discharge to the sea or in the coastal areas. Throughout the Pennsylvanian or younger rocks of the study corridor, the regional flow direction is towards the sea, mainly in an easterly direction. In the northern units, flow is generally towards Chaleur Bay. There will likely be considerable local variation along the study corridor.

B.1.6 Vegetation

B.1.6.1 Ecoregions and Ecodistricts

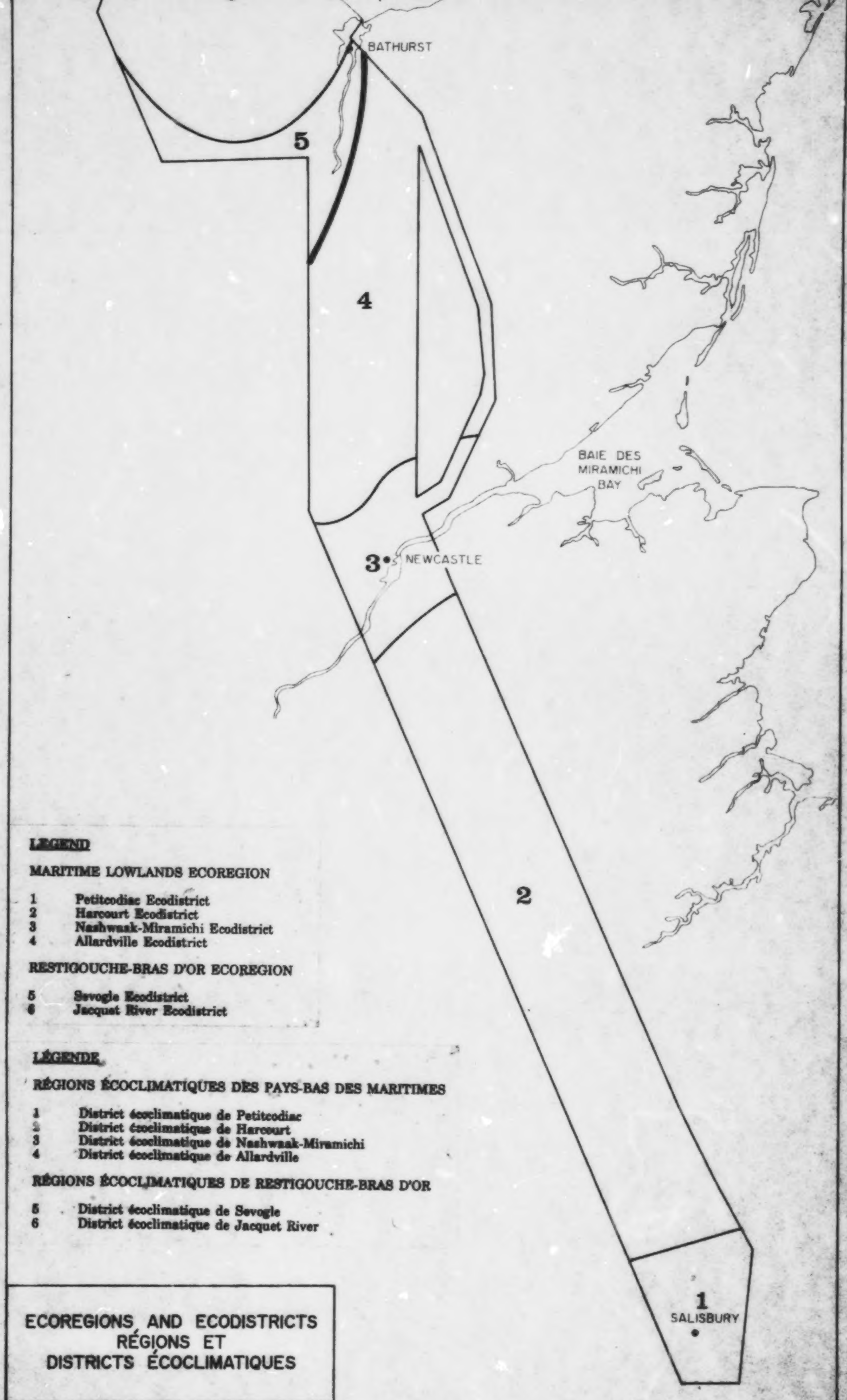
Ecoregions are geographic units recognized in relation to environmental criteria; they have been grouped together into broad-based Forest Zones based on dominant species composition (Loucks 1962). The Ecoregions are subdivided into Site Districts or Ecodistricts distinguished by criteria such as relief patterns, soil composition, bedrock type, and drainage pattern.

The study corridor is comprised of two Ecoregions (Figure B-5):

- the Maritime Lowlands Ecoregion of the Red Spruce-Hemlock-Pine Forest Zone; and
- the Restigouche-Bras d'Or Ecoregion of the Sugar Maple-Hemlock-Pine Forest Zone.

The Maritime Lowlands Ecoregion, in relation to the study area, extends between Salisbury in the south to Allardville in the north, and includes the Newcastle-Chatham area. It is a poorly drained region characterized by heavy textured soils, and is subdivided into four Site Districts: Petitcodiac, Harcourt, Nashwaak-Miramichi and Allardville. The ecoregion is comprised of red spruce (*Picea rubens*), black spruce (*Picea mariana*), balsam fir (*Abies balsamea*), red maple (*Acer rubrum*), hemlock (*Tsuga canadensis*) and white pine (*Pinus strobus*) which is a distinctive lowland forest association. Jack pine (*Pinus banksiana*) is abundant on sandy soils. Red maple and wire birch (*Betula glandulosa*) predominate as fire types. Beech (*Fagus grandifolia*) forms pure stands on exposed ridges, but yellow birch (*Betula alleghaniensis*) and sugar maple (*Acer saccharum*) can cover the larger hills. Local climate and species distribution are influenced by the numerous black spruce swamps and bogs. The study corridor crosses four districts of the Maritime Lowlands Ecoregion, described as follows:

- the Petitcodiac District comprises the rolling Petitcodiac River valley including Salisbury and other settled areas which form a patchwork of agricultural lands; the central core is characterized by tolerant hardwoods on exposed sites, and hemlock, yellow birch, red spruce, black spruce, balsam fir and pine on slopes and lower ridges; flatter, poorly drained sites are situated to the north;



LEGEND

MARITIME LOWLANDS ECOREGION

1 Petitcodiac Ecodistrict
2 Harcourt Ecodistrict
3 Nashwaak-Miramichi Ecodistrict
4 Allardville Ecodistrict

RESTIGOUCHE-BRAS D'OR ECOREGION

5 Sevogle Ecodistrict
6 Jacquet River Ecodistrict

LÉGENDE

RÉGIONS ÉCOCLIMATIQUES DES PAYS-BAS DES MARITIMES

1 District écoclimatique de Petitcodiac
2 District écoclimatique de Harcourt
3 District écoclimatique de Nashwaak-Miramichi
4 District écoclimatique de Allardville

RÉGIONS ÉCOCLIMATIQUES DE RESTIGOUCHE-BRAS D'OR

5 District écoclimatique de Sevogle
6 District écoclimatique de Jacquet River

ECOREGIONS AND ECODISTRICTS
RÉGIONS ET
DISTRICTS ÉCOCLIMATIQUES

wms associates ltd.
ENVIRONMENTAL CONSULTANTS AND PLANNERS
wms associés ltée
AMÉNAGISTES ET PROFESSIONNELS DE L'ENVIRONNEMENT

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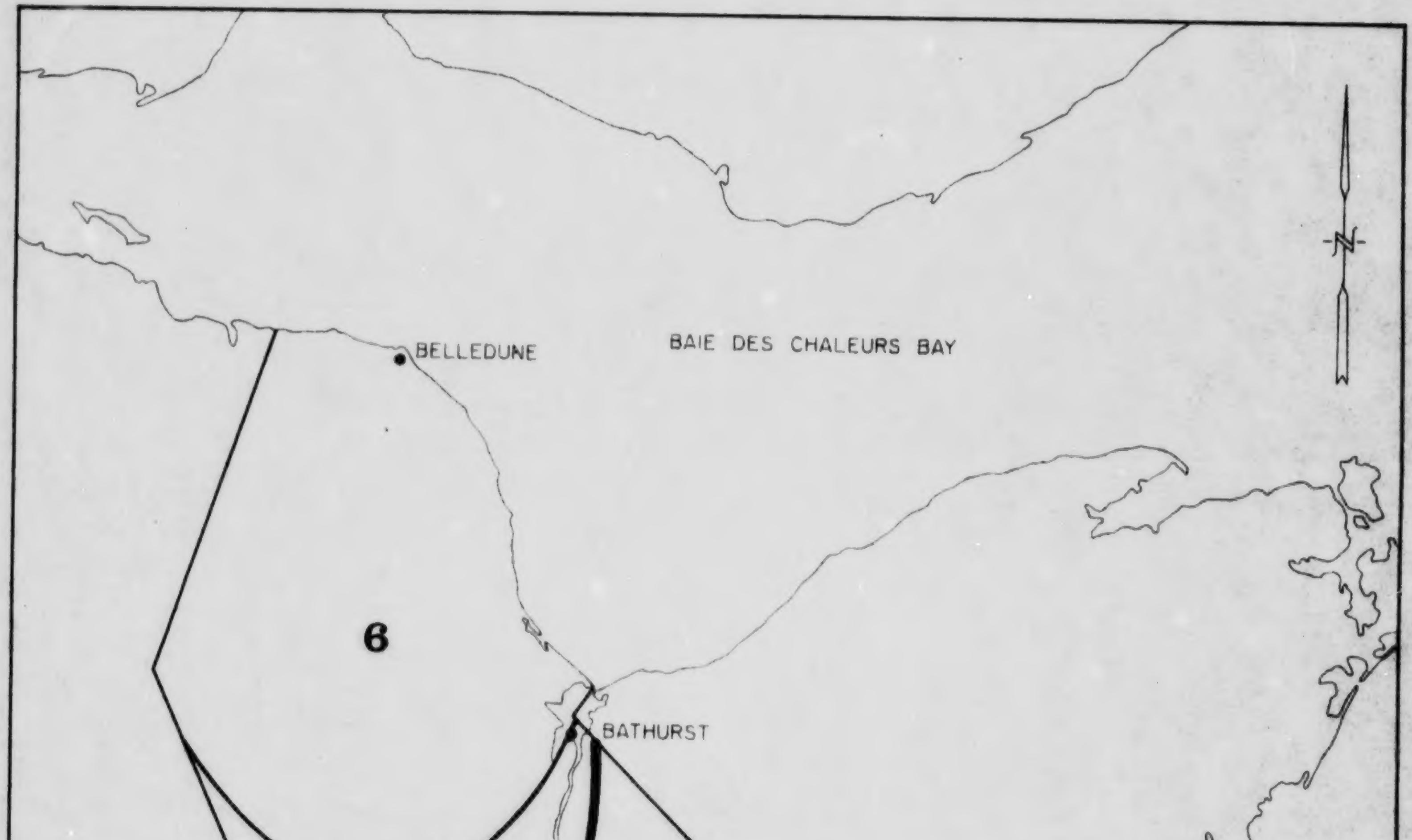
BELLEDUNE
BAIE DES CHALEURS BAY
N
6
BATHURST
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4

- the Harcourt District is a flat, poorly drained lowland plain which forms the height of land between the Saint John River and the Northumberland Strait; it comprises most of the region south of the Miramichi River and north of the Petitcodiac District; bogs and black spruce swamps are common; the common cover type is jack pine with an understorey of black spruce and balsam fir; hemlock was formerly abundant, and jack pine and red pine are well adapted to the seasonally wet terrain;

- the Nashwaak-Miramichi District comprises the strongly dissected Miramichi River portion of the study area; tolerant hardwoods occur on ridges and some slopes, and balsam fir, red spruce and hemlock make up the stable forest on zonal sites; white pine is common and often forms stands along the rivers; and

- the Allardville District comprises the elevated region southeast of Bathurst and north of the Miramichi area; some well-drained ridges support red spruce, hemlock, beech, yellow birch and red maple; jack pine dominated stands are found on burned areas.

The Restigouche-Bras d'Or Ecoregion is characterized by poor quality but tolerant forests of beech and sugar maple at higher elevations. Slopes and valley bottoms are dominated by balsam fir, white spruce (*Picea glauca*), black spruce and white pine. The study corridor traverses two subdivisions, the Sevogle District and the Jacquet River District:

- that portion of the Sevogle District crossed by the study corridor is the small region around the Nepisiguit River; sugar maple, beech, white pine and red spruce are found throughout, but pure coniferous areas also occur; dense spruce and fir dominate the slopes and broad valley flats; and

- the area west of Bathurst and north to Belledune comprises the gently rolling Jacquet River District, which is a coastal plain with weather moderated by Chaleur Bay; tolerant hardwoods, with spruce, fir and white pine, predominate; red spruce occurs locally in the south, and hemlock is scarce; the coniferous dominated coastal portion is flat and poorly-drained, although black ash (*Fraxinus nigra*) species swamps are common.

B.1.7 Mammals

Characteristic mammals of eastern New Brunswick include snowshoe hare (*Lepus americanus*), American red squirrel (*Tamiasciurus hudsonicus*), American beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), American black bear (*Ursus americanus*), American marten (*Martes americana*), white-tailed deer (*Odocoileus virginianus*) and moose (*Alces alces*).

White-tailed deer and moose are common in the area, generally associated with regenerating forests which provide an abundance of lush vegetation for food. Black bear, coyote, red fox, beaver, otter, mink and snowshoe hare are found throughout the region, while the distribution of marten tends to be localized.

B.1.7.1 White-Tailed Deer

Abundance and Distribution

White-tailed deer are common to abundant throughout New Brunswick; however, quantitative data on the abundance and distribution of this species within the study corridor are lacking.

Harvest statistics maintained by DNRE provide an indication of the relative abundance of deer along the corridor between 1986 and 1988 by Parish (Table B-1). Parish locations are shown on Figure 1-1. Coverdale Parish in Albert County and Salisbury Parish in Westmorland County have relatively high deer harvests (4.5 to 8.6 per 10 km^2, and 4.8 to 6.2 per 10 km^2, respectively). Harcourt Parish in Kent County borders Salisbury Parish on the north, and has a similarly high annual harvest (3.8 to 4.4 per 10 km^2). The harvest in Huskisson Parish to the north was low (0.68 to 1.18 deer per 10 km^2). Also relatively low was the harvest in Rogersville, Nelson, Derby and Newcastle Parishes of Northumberland County, Allardville, Bathurst and Beresford Parishes in Gloucester County, and Durham Parish in Restigouche County. Within the study corridor, most deer were harvested in the Salisbury to Harcourt area. The harvest figures for the Parishes above (Table B-1) not only reflect the relative hunter effort but also the relative deer densities.

The harvest records indicate that while New Brunswick has historically supported a large white-tailed deer population, population levels have varied widely. Deer were scarce or absent in the Province during the late 1800s, but increased rapidly to remarkably high levels by the 1940s (Kelsall and Prescott 1970). From 1950 to 1960 the harvest of deer averaged 22,000 per year or

TABLE B-1: DEER HARVEST DATA PER KM^2 FOR PARISHES WITHIN THE STUDY CORRIDOR

COUNTY/Parish	AREA (km^2)	Kill Per 10 km^2 1986	1987	1988
ALBERT				
Coverdale	286.10	8.60	6.78	4.54
WESTMORLAND				
Salisbury	908.30	6.21	5.25	4.81
KENT				
Acadieville	332.90	1.59	1.17	1.23
Harcourt	1170.30	4.24	4.43	3.77
Huskisson	380.60	.68	1.84	1.16
St. Louis	254.10	1.02	.79	1.61
Weldford	638.20	1.91	1.96	1.91
NORTHUMBERLAND				
Derby	66.50	1.20	1.65	.30
Nelson	384.90	1.22	2.05	1.38
Newcastle	677.00	.53	.41	.21
Rogersville	332.30	1.20	.84	1.02
GLOUCESTER				
Allardville	658.60	.23	.21	.08
Bathurst	1610.80	.31	.26	.06
Beresford	560.00	1.09	.89	.25
RESTIGOUCHE				
Durham	558.20	.30	.09	.07

SOURCE: T. Pettigrew, R. Currie, G. Godin, DNRE (pers. comm.)

0.3 per km^2 (Huot, et al. 1984). Overhunting and severe winters in the late 1960s and early 1970s were thought to have been responsible for an abrupt population decline. However, in 1980, the Provincial deer harvest had recovered to previous levels. The white-tailed deer harvest has declined in the last three years in all six counties crossed by the proposed route.

Limiting Factors

Weather has been reported by some to be the most important natural factor affecting white-tailed deer, as severe winter snow depths and temperatures can limit deer numbers (Halls 1984). A series of severe winters in the 1970s caused a pronounced population decline over much of Quebec and New Brunswick (Huot, et al. 1984). Snow depth is of particular importance because it restricts movements, increases energy expenditure, decreases the availability of food, and increases vulnerability to predation. Drolet (1976) and Kelsall and Prescott (1970) found that snow depths exceeding 40 cm severely limit movements of white-tailed deer. Westworth (1979) found that during a severe winter when snow depths exceeded 50 cm, activity of white-tailed deer was confined to sites containing mature, coniferous cover, and feeding trails seldom extended more than 50 m into open habitats. The deep snow made deer extremely vulnerable to predation. In areas where winter weather conditions are limiting, availability of coniferous cover is an important factor in the winter survival of white-tailed deer (Ozoga 1968; Verme 1969; Drolet 1976; Euler and Thurston 1980; Boer 1978).

Major predators of white-tailed deer in southeastern Canada include the coyote, bobcat (*Lynx rufus*), and black bear (Halls 1984; Franzmann, et al. 1980; Hilton 1978; Messier and Barrette 1985). Coyotes have become a serious problem in some deer wintering areas of the Province and control measures, i.e., trapping in deer yards, is being undertaken by DNRE in some of these locations (R. Currie and G. Godin, pers. comm.). Feral and domestic dogs are also a problem in New Brunswick (A. Boer, pers. comm.).

Legal hunting in the fall usually accounts for 20 to 50 percent of white-tailed deer mortality in the fall-winter period, depending on the severity of the winter conditions (Huot, et al. 1984). In 1990, the regular season took place between October 22 and November 17. Up to 1988, deer of any sex or age could be harvested; in 1988, a "bucks only" deer harvest was initiated in the northern Wildlife Management Zones. In 1990, antlerless deer (does and fawns) quotas were established in order to manipulate the harvest. The success rate of hunters has increased from about eight percent in the mid-1970s to over 20 percent in the early 1980s, indicative of an increasing population of deer. Recently, the harvest has declined Province-wide (G. Redmond, pers. comm.). In New Brunswick, the causes of deer mortality by natural and unnatural means, in decreasing order of importance, are reportedly (A. Boer, pers. comm.):

- legal hunting;
- poaching;
- winter losses (malnutrition, i.e. starvation);
- predation;
- vehicles/trains; and
- domestic dogs.

There are several human-related factors other than legal hunting which contribute to deer mortality. Deer-vehicle collisions can produce substantial mortality in deer populations (Cypher and Cypher 1988). In New Brunswick, the highest accidental kills occur in June, with a second peak in October (A. Boer, pers. comm.). Poaching is also a significant source of human-related mortality, although it is difficult to quantify; some surveys indicate that illegal deer harvests may equal or exceed legal harvests (Vilkitis 1971; Hesselton and Hesselton 1982, cited in Cypher and Cypher 1988).

Habitat Relationships

Most of the studies conducted on habitat selection by white-tailed deer in New Brunswick have focused on winter habitat use (Telfer 1967a; 1967b; 1970) and the role of snow depth as a factor affecting white-tailed deer distribution and habitat selection (Kelsall 1969; Telfer 1970; Kelsall and Prescott 1970). This reflects the importance of winter range in the life history of deer in central and northern New Brunswick, where snow depths and winter temperatures can have a pronounced influence on deer survival (Boer 1978; Boer, et al. 1982).

Movement to wintering areas or yards usually starts in December and may be triggered more by cold weather than by snow depths (Ozoga and Gysel 1972). Ozoga and Gysel (1972) monitored daily activity of white-tailed deer in a conifer swamp deer yard in northern Michigan during the winter of 1963-1964. The use of protective (dense) cover by deer increased during periods of low temperature and high air chill, despite the lack of deep snow. Conifer stands provide warmer microclimates in winter because windflow and windchill factors are lower (Ozoga 1969) and radiant heat loss is reduced (Moen 1968).

Deer Wintering Areas

Deer are widely distributed across the Province, and form yards or concentrations in winter, chiefly in coniferous stands, for thermal protection from adverse conditions such as low temperatures, wind and deep snow (Huot, et al. 1984). Deer wintering areas (DWAs) in the northern portion of the Province are mostly small and scattered; those in the southern portion are larger but less numerous. The integrity of northern DWAs is important due to the severity of the winters. The extreme southern portion of the Province has almost continuous deer wintering habitat to take advantage of the milder winters and relative lack of snow. In summer, deer in New Brunswick choose forested areas which contain mixed stands, openings and clear-cuts.

Boer (1978) and Boer, et al. (1982) reported that the characteristics of DWAs in New Brunswick vary across the Province, but that they typically consist of mature stands of white spruce and balsam fir on gently sloping, southern exposures. DWAs are traditional, with the same deer returning each year (Boer 1978; Boer, et al. 1982). Drolet (1976) noted that while DWAs were typically used, the degree of concentration varied throughout the winter and from year-to-year, depending on the severity of winter weather. Because of the need to protect DWAs in the context of timber harvesting and other activities, DNRE has delineated known DWAs using information from aerial and ground surveys, forest-stand boundaries and contour lines (Boer 1978).

Between 1973 and 1977, DNRE surveyed the Province to locate DWAs (Boer 1978). Present knowledge of DWA extent, population and location stems in most part from these surveys, and from later surveys conducted on a local basis by DNRE Regional Biologists. Wintering area boundaries can change from year to year because of a number of reasons (Boer 1978; Drolet 1976), including the severity of the winter and forestry operations. Forestry operations have affected the size or eliminated some DWAs. DWA locations in New Brunswick may be turning over at about 5 percent per year in response to forest harvesting (A. Boer, pers. comm.). The dynamics of DWA locations and boundaries confounds transmission line route selection; the presence of a right-of-way will limit these dynamics.

There are at least 69 DWAs within the study corridor, ranging in size from small (only a few deer) to very large (over 200 deer) (G. Godin, R. Currie, T. Pettigrew, pers. comm.). In the northern portion of the corridor, Pointe-Verte to Nicholas-Denys, the DWAs are mostly small, and are scattered throughout the area to the west of the settlements. There is a major wintering area north of Bathurst Mines, situated south of Middle River. There are also several smaller DWAs in this portion of the corridor. The area south of Bathurst has a few small DWAs. In the Nepisiguit River (Bathurst Mines) to Bartibog (Highway 8) area, there are a few larger DWAs, chiefly in the Busridge, Bartibog Station, south of Bathurst Mines and Northwest Miramichi River area.

DWAs in the Newcastle region are located northwest of the city, in the Maple Glen to Chaplain Island Road area. South of Newcastle, there is a large wintering area near Semiwagan Ridge. The southern portion of the corridor has a few large areas, chiefly between Mortimer and Smith's Corner, which are described as critical (T. Pettigrew, pers. comm.) and near Kent Junction and Cordy Brook. The southernmost DWAs are located in the Monteagle and Pacific Junction areas. Probably 200 deer inhabit an area of freehold land west of the Monteagle Road and north of Highway 112 (T. Pettigrew, pers. comm.).

B.1.7.2 Moose

Abundance and Distribution

Moose are common throughout New Brunswick. However, quantitative data on the abundance and distribution of this species within the study region are lacking. Moose do not form wintering concentrations to the same extent as deer (G. Godin, R. Currie and T. Pettigrew, pers. comm.). Moose are not as affected by snow conditions as deer and are therefore more mobile and not restricted to traditional wintering areas during the December to April period. Moose congregate in groups of from three to four up to a high of 20 in east central New Brunswick (R. Currie, G. Godin, T. Pettigrew, pers. comm.).

Table B-2 presents moose harvest figures for the Parishes situated along the study corridor. Acadieville, Harcourt, Rogersville, Nelson and Bathurst Parishes have the highest harvest. Generally speaking, the area south of Newcastle has a high moose population, with one of the heaviest concentrations in the Province (R. Currie, pers. comm.); moose populations elsewhere are much lower.

TABLE B-2: MOOSE HARVEST DATA PER KM^2 FOR PARISHES ALONG THE STUDY CORRIDOR

COUNTY/Parish	AREA (km^2)	Kill Per 10 km^2 1986	1987	1988
ALBERT				
Coverdale	286.10	.10	.03	.07
WESTMORLAND				
Salisbury	908.30	.11	.08	.00
KENT				
Acadieville	332.90	.36	.30	.33
Harcourt	1170.30	.45	.49	.27
Huskisson	380.60	.18	.16	.05
St. Louis	254.10	.16	.16	.08
Weldford	638.20	.08	.09	.06
NORTHUMBERLAND				
Derby	66.50	.15	.15	.15
Nelson	384.90	.44	.39	.42
Newcastle	677.00	.18	.21	.24
Rogersville	332.30	.69	.57	.45
GLOUCESTER				
Allardville	658.60	.35	.58	.32
Bathurst	1610.80	.32	.36	.35
Beresford	560.00	.25	.14	.16
RESTIGOUCHE				
Durham	558.20	.09	.14	.09

SOURCE: T. Pettigrew, R. Currie, G. Godin, DNRE (pers. comm.)

Limiting Factors

The average annual mortality rates for adult male and female moose in New Brunswick has been estimated at 47 and 25 percent, respectively (Boer 1988). The difference is largely due to the high vulnerability of adult moose greater than one-year-old to harvesting during the fall rutting period (Boer 1988). Boer (1988) also reports that legal hunting accounts for 20 percent of adult male mortality and 7 percent of adult female mortality; the remainder is thus non-hunting mortality factors such as poaching, parasites and vehicle collisions.

The black bear is the only predator of moose calves found in New Brunswick (Wright 1956). Mortality rates resulting from black bear predation have not been determined, however, it is thought that relatively few are taken (Boer 1987).

Deer are chronic carriers of a parasitic nematode (*Parelaphostrongylus tenuis*) which, in moose, causes a loss of coordination, blindness and mortality, and which has been one of the chief mortality agents of moose in the Maritimes (Kelsall and Prescott 1970). Gilbert (1974) and Telfer (1967a; 1967b) suggest that the prevalence of this nematode in moose is directly related to white-tailed deer density, since this species is an endemic reservoir for this nematode. About a half-dozen moose with symptoms of this disease are reported in the region each year (R. Currie, pers. comm.).

Mortality of adult moose occurs in summer in New Brunswick from accidents, including roadway collisions with vehicles, but the effect on the population is not known (Boer and Keppie 1988).

Habitat Relationships

Most of the studies conducted on habitat selection by moose in New Brunswick and Nova Scotia have focused on winter habitat use (Kelsall 1969; Telfer 1967a; 1967b; 1970). In both Provinces, there are substantial areas of seemingly good moose habitat that contain low densities of moose (Kelsall 1969). Highest densities are usually found in high country, where deer are scarce or absent in winter and uncommon in summer (Kelsall 1969).

In northern New Brunswick, moose have been observed feeding on regenerating vegetation in cuts and burns as young as two years (R. Currie, pers. comm.). Moose often winter in valleys, restricting their movements to well-worn trails along river banks and to shrubby open woodland when snow depths exceed one metre. Several moose may use the same wintering area (Telfer 1967a; 1967b). Moose and white-tailed deer in the study region are known to use the same wintering area on occasion, but usually remain mutually exclusive (R. Currie, pers. comm.). Kelsall (1969) determined that snow depths of about 30 percent less than chest heights seriously impede moose, but because moose are taller than deer, they are less restricted by deep snow. Previous studies conducted by Telfer (1970) showed moose avoided dense-canopied forest types with a high proportion of conifers and favoured more open forests. However, during months with heavy snowfall, most activity occurred in stands of dense coniferous forest (Telfer 1970). Peek, et al. (1976) found that large aggregations of moose seen in early winter were concentrated in the most open areas. Habitats used during January-March, when moose aggregations were smallest, depended upon snow characteristics and weather conditions (Peek 1971). In summer, moose are found in wetlands and open areas, feeding on grasses and forbs, and aquatic plant roots. Moose use wooded areas and wetlands to shelter from the sun in spring and summer (A. Boer, pers. comm.).

B.1.7.3 Marten

Furbearers in the Province of New Brunswick are managed in three fur harvest zones, Northern, Central and Southern. Harvest statistics are calculated by county within each of the fur harvest zones, and are not available specifically for the study corridor. Data for the counties crossed by the study corridor (Albert, Westmorland, Kent, Northumberland, Gloucester and Restigouche) will be used in discussing harvest statistics.

Abundance and Distribution

The marten (*Martes americana*) is found throughout forested regions of Canada, north to the tree line (Strickland and Douglas 1987). In areas where suitable habitat has been cleared and/or over-trapping has occurred, marten densities have been reduced to the point of extirpation. The marten is now common in the northwestern third of New Brunswick (Dilworth 1974; Hutchinson 1985). The original range of the eastern type, *Martes americana americana*, is restricted to heavily wooded parts of eastern Canada and adjacent parts of the United States (de Vos 1952). The ranges of marten in North America coincide largely with the transcontinental climax coniferous forest (de Vos 1952; Soutiere 1979). Before western settlement, the species also occurred in northern hardwood forests which had an inter-mixture with coniferous species (de Vos 1952). They were successfully reintroduced at Fundy National Park by the Canadian Wildlife Service and Parks Canada in 1983-1984 (Hutchinson 1985). Coulter (1959) thought that the restricted range of the marten in Maine is probably due to the possibility that marten are not as adaptable to habitat changes, as are similar species such as fisher (*Martes pennanti*).

Although harvesting regulations vary from province to province, in all areas the marten is classified as a protected furbearer; only registered or licensed trappers can take marten (Hutchinson 1985). Marten naturally experience fluctuations in population levels over time (Keith 1963). Natural disasters may also affect harvest levels, as when populations of martens (and muskrats and beavers) were reduced by fires in Saskatchewan in 1800 (Novak, et al. 1987). Marten populations across the country seem to be stable or increasing, and current regulated harvest levels have not posed a threat to the population (Hutchinson 1985).

There are no reports or maps describing marten populations in New Brunswick. However, marten are found north of the Miramichi River (D. Cartwright, pers. comm.). The Department of Natural Resources and Energy has no management plans for marten; control is strictly through harvesting and the setting of seasons for harvesting (D. Cartwright, pers. comm.).

The Fish and Wildlife Branch of the Department of Natural Resources and Energy are in the process of arranging for the preservation of land containing over-mature conifer/mixed-woods stands as marten habitat reserves; any transmission line route cutting through suitable marten habitat would have to be taken into consideration in the Department's plans to set aside this land (D. Cartwright, pers. comm.)

Limiting Factors

The pine marten has suffered a gradual decline in its eastern range for two major reasons (de Vos 1952; Soutiere 1979):

- overtrapping since the early part of the Century; and
- changes in forest composition because of extensive logging, forest fires and settlement.

Timber harvesting remains a major factor in establishing and maintaining seral plant and animal communities in the marten's eastern range (Soutiere 1979). In a study conducted in Maine, Soutiere (1979) found that timber harvesting had affected the marten's activity in and preference for the major forest types. Marten activity in undisturbed eastern forest is highest in softwood-dominated mixed stands and lowest in hardwood stands; however, in harvested forests, marten activity was highest in lightly cut hardwood stands. Soutiere (1979) concluded that the impact of timber harvesting on marten populations depended on the severity of the habitat disturbance, and that marten were not restricted to climax forests. Partial, i.e., selective, cutting methods are recommended for marten habitat preservation in multiple-use forests where marten are present.

Habitat Relationships

Marten are a climax species, and mature conifer or mixed-wood forests are generally their preferred habitat (Soutiere 1979; Steventon and Major 1982). Uncut softwood islands and partially cut mixed stands in northern Maine are heavily used by marten during both summer and winter, with regenerating clear-cuts generally less used than expected (Steventon and Major 1982). Clear-cut areas may be under-used because of poor hunting conditions for marten in this type of habitat (Steventon and Major 1982), as regenerating clear-cuts support dense growths of herbaceous plants, raspberries, intolerant hardwoods and softwood regeneration, all of which may hinder visual contact with prey and provide escape cover for small mammals (Koehler and Hornocker 1977). Soutiere (1979) found that marten crossed open areas in winter but did so in a direct manner and did not linger to hunt.

B.1.8 Birds

Characteristic birds of the boreal region (Erskine 1977) of eastern New Brunswick include:

- American black duck (*Anas rubripes*) in shallow marshes in forest;
- common goldeneye (*Bucephala clangula*) in deep marsh to open water in forest;
- red-tailed hawk (*Buteo jamaicensis*) in conifer and mixed forest;
- greater yellowlegs (*Tringa melanoleuca*) in fen and bog;
- barred owl (*Strix varia*) in mixed and broad-leafed forest;
- ruby-throated hummingbird (*Archilochus colubris*) in broad-leafed forest edge;
- northern flicker (*Colaptes auratus*) in forest edge;
- yellow-bellied sapsucker (*Sphyrapicus varius*) in mixed and broad-leafed forest;
- eastern phoebe (*Sayornis phoebe*) in broad-leafed forest edge;

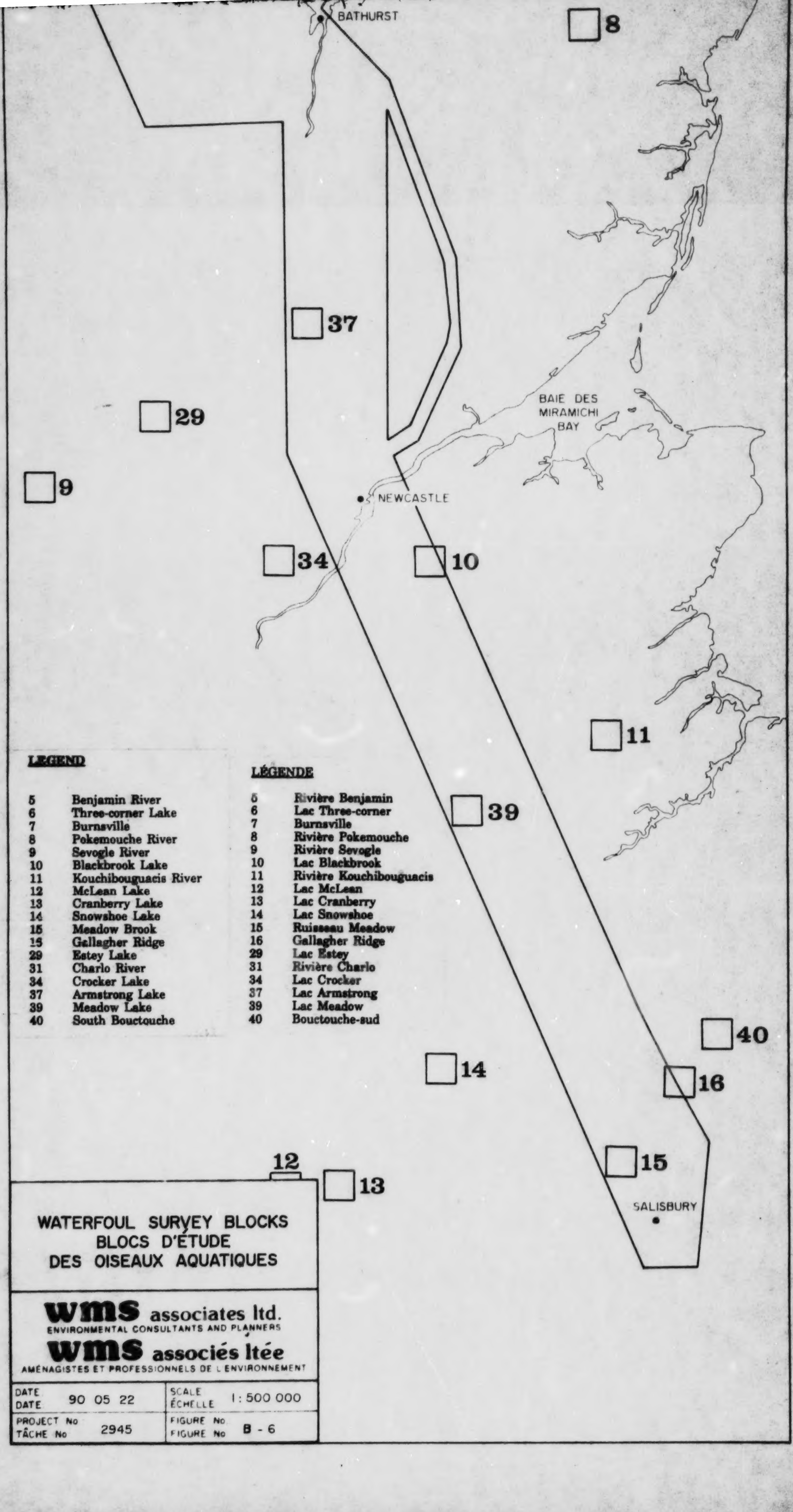
- alder flycatcher (*Empidonax alnorum*) in wetland edge scrub;
- blue jay (*Cyanocitta cristata*) in mixed and broad-leafed forest and edge;
- American crow (*Corvus brachyrhynchos*) in varied habitats, including coastal;
- boreal chickadee (*Parus atricapillus*) in conifer forest;
- yellow-rumped warbler (*Dendroica coronata*) in conifer forest;
- black-throated green warbler (*Dendroica virens*) in conifer and mixed forest;
- mourning warbler (*Oporornis philadelphia*) in broad-leafed forest edge;
- rusty blackbird (*Euphagus carolinus*) in conifer forest bogs;
- rose-breasted grosbeak (*Pheucticus ludovicianus*) in mixed and broad-leafed forest;
- purple finch (*Carpodacus purpureus*) in conifer and mixed forest and edge; and
- dark-eyed junco (*Junco hyemalis*) in conifer and mixed forest edge.

B.1.8.1 Waterfowl

Abundance and Distribution

New Brunswick lies along the eastern side of the Atlantic flyway. Although New Brunswick, like the rest of the Atlantic Canada, is largely comprised of habitats with a low capability for producing waterfowl, the Province still contributes an estimated 25 percent of the breeding waterfowl population of Eastern Canada (Erskine 1987a; 1987b). The most productive wetlands in Atlantic Canada are associated with coastal salt marshes, adjacent brackish marshes and alluvial floodplains (Erskine 1987b).

The Canadian Wildlife Service has been conducting bird habitat management programs in the form of waterfowl breeding pair surveys throughout the Province since 1986 (Erskine, et al. 1990; G. Parker, pers. comm.). Surveys were carried out on 41 25 km^2 survey blocks which are



LEGEND

5	Benjamin River
6	Three-corner Lake
7	Burnsville
8	Pokemouche River
9	Sevogle River
10	Blackbrook Lake
11	Kouchibouguacis River
12	McLean Lake
13	Cranberry Lake
14	Snowshoe Lake
15	Meadow Brook
16	Gallagher Ridge
29	Estey Lake
31	Charlo River
34	Crocker Lake
37	Armstrong Lake
39	Meadow Lake
40	South Bouctouche

LÉGENDE

5	Rivière Benjamin
6	Lac Three-corner
7	Burnsville
8	Rivière Pokemouche
9	Rivière Sevogle
10	Lac Blackbrook
11	Rivière Kouchibouguacis
12	Lac McLean
13	Lac Cranberry
14	Lac Snowshoe
15	Ruisseau Meadow
16	Gallagher Ridge
29	Lac Estey
31	Rivière Charlo
34	Lac Crocker
37	Lac Armstrong
39	Lac Meadow
40	Bouctouche-sud

WATERFOUL SURVEY BLOCKS
BLOCS D'ÉTUDE
DES OISEAUX AQUATIQUES

wms associates ltd.
ENVIRONMENTAL CONSULTANTS AND PLANNERS
wms associés ltée
AMÉNAGISTES ET PROFESSIONNELS DE L'ENVIRONNEMENT

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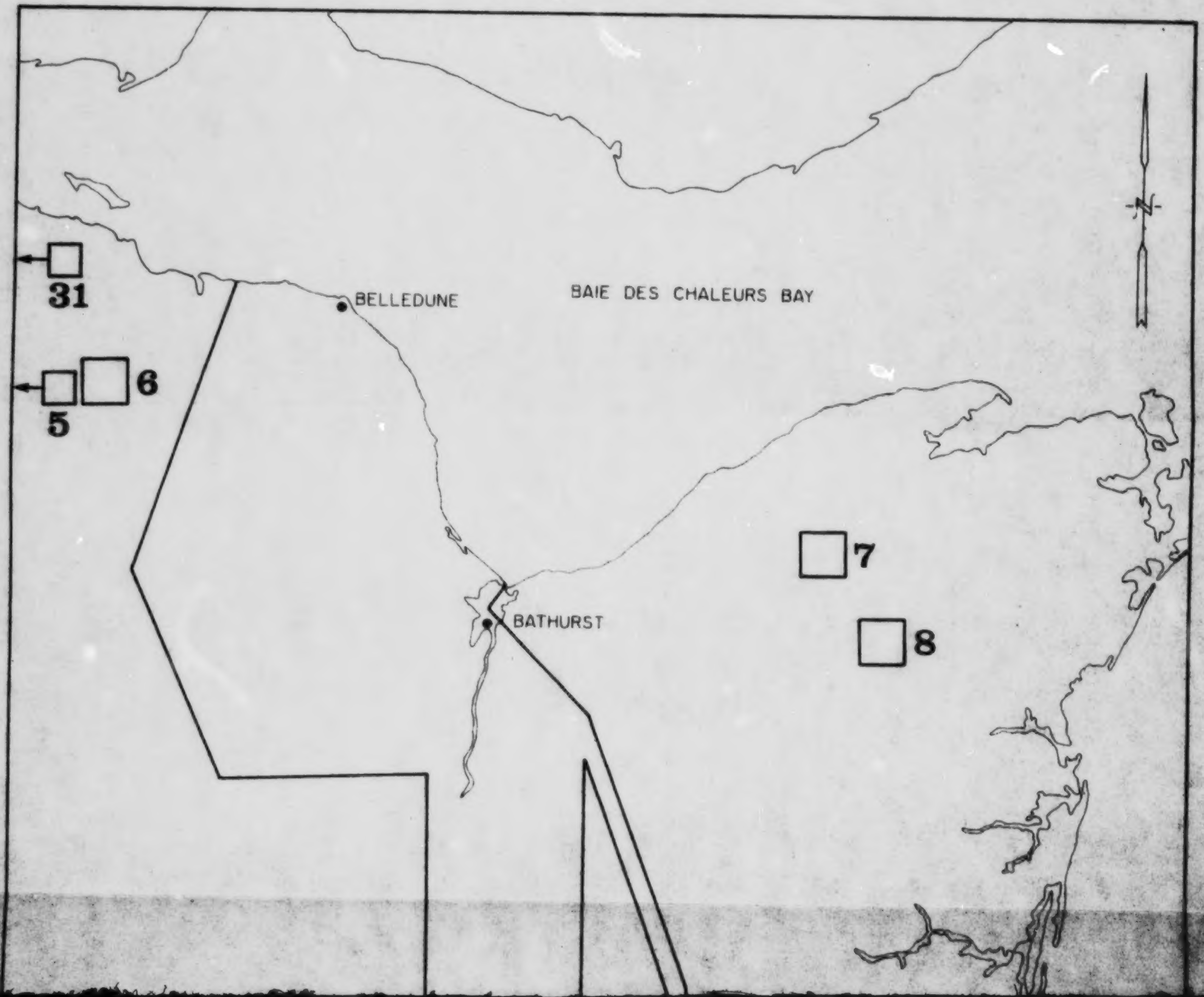

31
5
6
BELLEDUNE
BAIE DES CHALEURS BAY
N
BATHURST
7
8

distributed across New Brunswick. Eighteen of these blocks are located in the vicinity of the study corridor (Figure B-6); survey results from these eastern blocks are considered to be representative of breeding waterfowl densities in eastern New Brunswick, which can be divided into three regions according to the distribution of the survey blocks:

- Northern - Gloucester and Restigouche Counties: blocks 5, 6, 7, 8, 31;
- Central - Northumberland and Kent Counties: blocks 9, 10, 11, 29, 34, 37, 39; and
- Southeastern - Queens and Westmorland Counties: blocks 12, 13, 14, 15, 16, 40.

Results for the 18 survey blocks are presented in Table B-3. Dabbling ducks were slightly more numerous than divers, with combined average densities of 35.8 and 31.2 birds/100 km^2, respectively. The black duck and ring-necked duck (*Aythya collaris*) were the most abundant species, together accounting for 77 percent of the total waterfowl density.

Survey results from 1986 to 1989 indicated that the 18 eastern survey blocks had a lower density of waterfowl (68.8 birds/100 km^2) than the Provincial average (116 birds/100 km^2) (Table B-3), and that only the south-eastern portion of the study region (109.7 birds/100 km^2) approached this Provincial average (Table B-4). Black ducks also had lower densities than the Provincial average, the lowest being the central region (23 birds/100 km^2). Ring-necked ducks were more common in the central region, the density of 33.1 birds/100 km^2 being almost the same as the Provincial average (34.8 birds/100 km^2).

Information on the common loon in New Brunswick collected by R. Stocek (pers. comm.) and conversations with resource personnel indicate that this species is not abundant along the study corridor. During the four survey years (1986-1989), only 4, 7, 4 and 4 loons respectively were recorded within the eighteen survey blocks, indicating that the species is relatively uncommon.

Limiting Factors

The importance of various mortality factors for waterfowl are difficult to evaluate, as dead birds are not obvious except during large-scale die-offs from disease (Kirby 1988). A variety of species prey on waterfowl but Kirby (1988) suggested that the raccoon and the crow were the most significant in terms of nest predation, while mink and snapping turtles were the most effective predators of young.

TABLE B-3: DISTRIBUTION OF WATERFOWL RECORDED DURING BREEDING PAIR SURVEYS OF 25 KM² BLOCKS IN THE STUDY CORRIDOR REGION, 1986-1989

	Survey Block	Black Duck EX,X	Green-winged Teal EX,X	Blue-winged Teal EX,X	Total Dabblers[1] EX,X	Ring-necked Duck EX,X	Mergansers[2] EX,X	Total Divers[3] EX,X	Total Waterfowl[4] EX,X
RESTIGOUCHE CO.									
Benjamin R.	5	19 4.75	0 0	0 0	19 4.75	2 .5	3 .75	7 1.75	26 6.5
Three-corner L.	6	31 7.75	7 1.75	2 .5	40 10.00	44 11	10 2.5	66 16.50	116 29.0
Charlo R.	31	30 7.50	9 2.25	0 0	41 10.25	17 4.25	14 3.5	41 10.25	82 20.5
GLOUCESTER CO.									
Burnsville	7	34 8.50	11 2.75	0 0	45 11.25	20 5.0	0 0	20 5.00	65 16.25
Pekemouche R.	8	31 7.75	5 1.25	0 0	38 9.50	16 1.5	8 2	14 3.50	52 13.00
NORTHUMBERLAND CO.									
Sevogle R.	9	21 5.25	7 1.75	4 1	32 8.00	2 0.5	1 .25	3 .75	38 9.50
Blackbrook L.	10	41 10.25	37 9.25	2 5	82 20.50	38 9.50	1 .25	39 9.75	18 4.00
Estey L.	29	12 3.00	2 .50	0 0	14 3.50	4 1.00	3 .75	7 1.75	26 6.50
Crocker L.	34	16 4.00	2 5.00	0 0	19 4.75	180 40	3 .75	165 41.25	18 4.50
Armstrong L.	37	25 6.25	1 .25	0 0	26 6.50	19 4.75	5 1.25	23 5.75	49 12.25
KENT CO.									
Kouchibouguacis	11	19 4.75	0 0	2 .5	26 5.60	9 2.25	6 1.50	15 3.75	41 10.25
Meadow L.	39	27 6.75	0 0	0 0	31 7.75	0 0	11 2.75	11 2.75	51 12.75
S. Bouctouche	40	25 6.25	1 .25	7 1.75	33 8.25	5 1.25	0 0	5 1.25	47 11.75
QUEENS CO.									
McLean L.	12	37 9.25	4 1.0	0 0	45 11.25	28 7.00	0 0	31 7.75	80 20.00
Cranberry L.	13	47 11.75	0 0	0 0	48 12.00	27 6.75	1 .25	28 7.00	330 82.50
Snowshoe L.	14	40 10.00	13 3.25	0 0	53 13.25	72 18.00	0 0	72 18.00	134 33.50
WESTMORLAND CO.									
Meadow Br.	15	3 .75	0 0	0 0	3 .75	0 0	4 1.0	4 1.00	7 1.75
Gallagher Ridge	16	40 10.00	8 2.00	0 0	49 12.25	9 2.25	2 .5	11 2.75	60 15.00
TOTAL		498	107	17	644	462	72	562	1238
Density/plot/yr		6.917	1.486	.2361	8.944	6.417	1	7.806	17.19
Density/100 km²		27.67	5.944	.9444	35.78	25.67	4	31.22	68.78
Prov. Density (/100 km²)		43.6				34.81			116.6

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[1] Includes black duck, green-winged teal, blue-winged teal, American wigeon, wood duck and mallard

[2] Includes common merganser, red-breasted merganser and hodded merganser

[3] Includes ring-necked duck, common goldeneye

[4] Includes total dabblers, total divers, common eider, Canada goose, black scoter

EX = Total number of waterfowl in the study plot over four years

X = Average number of waterfowl (EX/number of years)

SOURCE: G. Parker (pers.comm.)

TABLE B-4: REGIONAL DENSITIES OF WATERFOWL RECORDED DURING BREEDING PAIR SURVEYS OF 25 KM^2 BLOCKS IN THE STUDY CORRIDOR REGION, 1986-1989

Regional Densities	Black Duck	Green-winged Teal	Blue-winged Teal	Total Dabblers[1]	Ring-necked Duck	Mergansers[2]	Total Divers[3]	Total Waterfowl[4]
Northern								
(nos.5,6,7,8,31)	145	32	2	183	89	35	148	341
Density/plot/yr	7.25	1.6	.1	9.15	4.45	1.75	7.4	17.05
Density/100 km^2	29	6.4	.4	36.6	17.8	7	29.6	68.2
Central								
(nos.9,10,11,29, 34,37,39)	161	49	8	230	232	30	263	239
Density/plot/yr	5.75	1.75	.2857	8.214	8.286	1.071	9.393	8.536
Density/100 km^2	23	7	1,143	32.86	33.14	4,286	37.57	34.14
South-Central								
(nos.12,13,14,15, 16,40)	192	26	7	231	141	7	151	658
Density/plot/yr	8	1.083	.2917	9.625	5.875	.2917	6.292	27.42
Density/100 km^2	32	4.333	1.167	38.5	23.5	1.167	25.17	109.7

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[1] Includes black duck, green-winged teal, blue-winged teal, American wigeon, wood duck and mallard
[2] Includes common merganser, red-breasted merganser and hodded merganser
[3] Includes ring-necked duck, common goldeneye
[4] Includes total dabblers, total divers, common eider, Canada goose, black scoter

SOURCE: G. Parker (pers.comm.)

Hunting (retrieved kill) of waterfowl in the northern half of New Brunswick during 1985 was estimated at 25,531 birds (Metras 1986). The estimated harvest for black duck, ring-necked duck, and red-breasted merganser (*Mergus serrator*) were 13,017, 1,112, and 156, respectively. Other human induced factors affecting waterfowl included acidic precipitation and the deterioration and loss of habitat (Ehrlich, et al. 1988).

Habitat Relationships

Most waterfowl species including the black duck, exhibit habitat preferences that refer to their primary requirements for breeding pair space, secure nesting cover, and suitable brood rearing habitat. Habitats supplying all of these needs must be present in proximity to each other to achieve high reproductive success.

The preferred forest habitat of the black duck throughout its range is beaver ponds (Whitman 1987; Renouf 1970). Kirby (1988) suggests that such areas provide excellent cover and contain high invertebrate productivity. Other areas used include the shallow margins of lakes, ponds and quiet streams (Godfrey 1986). Ring-necked ducks are commonly associated with wooded marshes, sedge meadows, and bogs (Bellrose 1976; Godfrey 1986). Such areas are rated lower for waterfowl inferring that ring-necked ducks can tolerate a lower habitat quality (A. Erskine, pers. comm.). The red-breasted merganser nests on the ground near marshes, lakes, and rivers (Bellrose 1976). In the proposed route, mergansers are commonly seen along the rivers where they feed on small fish (C. Stewart, pers. comm.).

Habitat suitability for breeding waterfowl within the proposed route is reflected by the Golet (1972) scores indicated in the New Brunswick Wetland Atlas (Environment Canada 1987b) (Table B-5). The Golet wetland evaluation system is based on most of the biophysical factors considered important to breeding waterfowl. The mean Golet scores of 68.0 to 70.5 recorded for rated wetlands along the corridor suggests that waterfowl habitat in the region is, on average, moderately productive (Table B-5). The corridor differs widely, however, in terms of the quantity of suitable habitat. The Salisbury to Newcastle portion contains the greatest amount of suitable waterfowl habitat, while the least amount is along the Bathurst to Belledune portion. The larger average size of wetlands in the Salisbury to Newcastle portion (89.8 ha) (Table B-5) may indicate a greater capability for species such as the common loon, which show a preference for large, open-water areas. Wetlands in the northern portion of the corridor are considerably smaller than those in the southern two portions of the route.

TABLE B-5: WETLANDS WITHIN AND CONTIGUOUS WITH THE STUDY CORRIDOR

Segment of Study Corridor	No. of Wetlands	Total Area (ha)	Average Golet Score	Average Area (ha)
Salisbury to Newcastle	44	3952.8	70.5	89.9
Newcastle to Bathurst	42	2798.6	68.0	66.6
Bathurst to Belledune	50	887.9	68.6	17.8
Total	136	7639.3		

SOURCE: Environment Canada (1987b)

Common loons breed on freshwater lakes which may support more than one territorial pair if the lake is large (Terres 1980). The relative scarcity of lakes along the proposed route limits the numbers of loons.

B.1.8.2 Upland Game Birds

The ruffed grouse (*Bonasa umbellus*), spruce grouse (*Canachites canadensis*) and American woodcock (*Philohela minor*), are important upland game species in New Brunswick. Spruce grouse have disappeared from many settled areas because of their vulnerability to overhunting, and are reported to be rare along the study corridor (J. Hachey, C. Stewart, B. Arbeau, pers. comm.). The American woodcock is reported to be abundant in some areas, where it is usually found in alder thickets along brooks (B. Arbeau, pers. comm.). Woodcock hunting is uncommon along the study corridor (B. Arbeau, J. Hachey and C. Stewart, pers. comm.). There are no habitat management programs for upland game birds in New Brunswick (P. Kehoe, pers. comm.).

Ruffed Grouse

The ruffed grouse is the most widely distributed grouse in North America (Cade and Sousa 1985). It is reported to be abundant along portions of the study corridor, however, quantitative data on its abundance and distribution are lacking. Numbers of ruffed grouse are reported to be increasing at this time in the areas south of Newcastle (B. Arbeau, pers. comm.).

The ruffed grouse is found mainly in second-growth deciduous and mixed woodland, wood edges and openings, alder and willow-bordered valleys and stream edges (Godfrey 1986). The following summary of the feeding requirements of ruffed grouse is taken from Cade and Sousa (1985):

> **Ruffed grouse feed on a variety of foods, with regional and seasonal variations in their diet. In regions where the snow cover is continuous, including New Brunswick, the winter diet is composed of buds and catkins of hardwood shrubs and trees, especially aspens (*Populus* spp.) which are an important winter food throughout much of their range. Summer foods include fruits, berries, green vegetation and insects.**

Nests are typically located at the bases of trees in open hardwood stands, although some sites are in slash piles, or under bushes.

A major requirement of male ruffed grouse is the stem density surrounding their drumming log which is important in the effective detection of predators. Throughout their range, grouse prefer drumming sites that are surrounded by a moderate density of stems, especially in the tall shrub or sapling layers. Optimal drumming cover occurs in 13 to 25-year-old aspen stands with a stem density of 4900 to 14,800/ha, and a closed canopy about 10 m overhead (Cade and Sousa 1985).

The suitability of tree stands for ruffed grouse is thus an evolving phenomenon; the age when a stand initially provides suitable habitat and the length of time it remains as suitable habitat depends on the growth rates of the cover species, and varies among species and their environments. Conifers can be detrimental to ruffed grouse survival in drumming areas because low-growing conifers offer concealment for mammalian predators.

In some areas, conifers provide the only suitable winter or drumming cover. In New Brunswick ruffed grouse inhabit spruce-fir and jack pine forests throughout the year (D. Keppie, pers. comm., cited in Cade and Sousa 1985). Conifers with branches which grow low to the ground also provide important thermal cover for grouse in regions where snow depths or snow conditions during winter limit snow-burrow roosting.

Ruffed grouse are often associated with disturbed forest habitats; however, elimination of forest cover over an area of >4 ha results in reduced breeding densities. The close interspersion of several smaller cover types is more valuable to grouse than extensive areas of a single cover type. This kind of interspersion of young through mature habitat can be created and maintained by small clear-cuts and burns.

B.1.8.3 Forest Avifauna

Abundance and Distribution

The check-list of New Brunswick birds (New Brunswick Federation of Naturalists 1985) lists 363 bird species for the Province; these include:

- 184 presently breeding or having bred in the last 50 years;

- 5 former breeding;
- 81 transients and winter visitors;
- 46 very rare non-breeders (not expected annually); and
- 47 accidental vagrants (recorded in not more than three of the last fifty years).

Prior to 1986 there had been no comprehensive survey for birds which covered the entire Province. Data existed for localized areas of interest to ornithologists, naturalists, and government biologists, and for species and species groups of economic interest. In 1986, a five-year project was initiated to determine and map the breeding status of each bird species in the three Maritime Provinces. This project, called the Maritimes Breeding Bird Atlas (MBBA) project (Kennedy 1986), uses a system of volunteers organised into 23 regional areas, each coordinated by a Regional Coordinator. The project uses the Universal Transverse Mercator (UTM) grid system which divides Canada into 10 km x 10 km squares. The MBBA project is not yet complete, and consequently many species whose ranges include northeastern New Brunswick have not yet been confirmed along the corridor. In two areas south of Newcastle, a previous study (WMS 1990a) using MBBA data from several 10 km x 10 km squares has identified a total of 92 to 105 species of an expected 80 to 100, indicating that the areas possibly contain more diverse habitat than originally expected.

B.1.9 Fish and Aquatic Habitat

New Brunswick's inland waters contain 51 species of freshwater and diadromous fish (Department of Fisheries and Oceans 1988). Of these, seventeen species (Table B-6) are considered game fish and are taken from at least one area of the Province. The most prominent and valued species is Atlantic salmon (*Salmo salar*), which is angled in rivers throughout the Province. However, brook trout (*Salvelinus fontinalis*) is also an extremely important and valued species recreationally. Striped bass (*Morone saxatilis*) is also angled in the Miramichi area (B. Dubé, pers. comm.).

Common commercial and recreational fish species occurring in the streams of the study area are Atlantic salmon, rainbow trout (*Salmon gairdneri*) and brook trout. Brook trout spawn in the fall in shallow, gravel-bottomed streams. Adult anadromous brook trout spend much of the year at sea close to their home streams (DFO 1988). Rainbow trout spawn in the spring in similar habitat to brook trout. Atlantic salmon spawn in the fall after having spent time wandering at

TABLE B-6: RELATIVE ABUNDANCE AND LOCATION OF NEW BRUNSWICK'S GAME FISH

Fish Species	Relative Abundance			Where Found in New Brunswick					
	Abundant	Common	Rare	Province-Wide	Northwestern New Brunswick	Western New Brunswick	Southwestern New Brunswick	Southern New Brunswick	Northern New Brunswick
COLDWATER GAME FISH									
Brook trout	X			X					
Atlantic salmon	X			X					
Landlocked salmon		X				X			
Lake trout		X				X			
Brown trout			X						X
Arctic char			X					X	
Smelt	X			X					
Burbot		X						X	
Round whitefish			X			X			
Lake whitefish		X					X		
Rainbow trout		X						X	
WARMWATER GAME FISH									
Smallmouth bass		X						X	
White perch		X						X	
Yellow perch		X			X				
Chain pickerel		X						X	
Bullhead		X			X				
Pumpkinseed sunfish		X						X	
Redbreast sunfish			X						X

SOURCE: Department of Fisheries and Oceans (1988) sea. These species are present at certain times of the year in many of the streams within the study corridor.

B.1.9.1 Freshwater Fish Resources

Information on fish presence and habitat was limited to larger streams and rivers where inventories had been completed (J. Gilbert, pers. comm.). Consideration was given only to that section of the watercourse within the 15 km wide corridor. The thirty-five watercourses identified below have been identified as having some significance for brook trout and Atlantic salmon (Table B-7).

Many of the small tributaries and streams that feed into these watercourses (Table B-7) have never been surveyed; relatively little information is known except that from local anglers. The area is rich in brook trout habitat, so it can be assumed that almost any permanent stream can provide enough habitat to support brook trout populations.

Brook trout are common in waters throughout the study area, and represent an important recreational resource throughout the Province. Similarly, Atlantic salmon are a very important recreational resource in the study corridor, particularly in the Miramichi River drainage. The Miramichi River and its tributaries drains an area of more than 6,500 km^2 (DFO 1987). The River and its tributaries are well known among sport fishermen and considered by many as the best Atlantic salmon angling rivers in North America. The Miramichi River system also supports brook trout, shad, gaspereau, eels, smelt and other species. Although the lower part of the River has been subject to industrial and municipal development, its main stem and most of its tributaries flow through relatively unpopulated areas. No natural barriers block the passage of fish and the few old logging dams on smaller tributaries are gradually being removed. The river's gradient is gentle; there are many resting pools for anadromous fish during upstream migration and there is an abundance of excellent salmonoid spawning and rearing habitat in the headwaters.

B.1.9.2 Life History of Selected Fish Species

Atlantic Salmon

The Atlantic salmon is an anadromous species, with eggs incubated in fresh water and juveniles migrating into salt water to complete their growth before returning to their natal streams to spawn. There are also populations of "land-locked" Atlantic salmon (often called ouananiche)

TABLE B-7: SUMMARY OF SIGNIFICANCE OF WATERCOURSES AS FISH HABITAT ALONG THE STUDY CORRIDOR

Salisbury to Newcastle:

Petitcodiac River Drainage:

- Petitcodiac River - important for salmon and trout populations; a known salmon spawning area is located upstream from Salisbury;
- North River - important trout habitat; a few juvenile salmon have been observed;

Saint John River Drainage

- Canaan River - salmon and trout;
- Salmon River - salmon spawning habitat in headwaters;

Richibucto River Drainage

- Coal Branch River and tributaries (South Forks and North Forks) - good trout habitat, but no spawning areas for trout or salmon; a few juvenile salmon have been observed;
- Trout Brook - salmon and trout;
- Hudson Brook - trout identified;
- Richibucto River - salmon and trout; an important sport fishing area;

Kouchibouguacis River Drainage

- Kouchibouguacis River - primarily trout;

Kouchibouguac River Drainage

- Kouchibouguac River - trout;

Southwest Miramichi River Drainage

- Barnaby River - no salmon above Rogersville due to dam construction; lower end of river important for trout and salmon;
- Right Hand Branch Barnaby River - trout;
- Middle Branch Barnaby River - trout;

Miramichi River Drainage

- Northwest, Southwest and Miramichi Rivers - mostly a corridor for salmon and trout; spawning areas are further upstream;

(Continued)

TABLE B-7: SUMMARY OF SIGNIFICANCE OF WATERCOURSES AS FISH HABITAT ALONG THE STUDY CORRIDOR (CONTINUED)

Northwest Miramichi River Drainage

- Northwest Millstream River - important rearing area for juvenile salmon and trout;
- East Branch Portage River - trout and juvenile salmon present;

Newcastle to Bathurst:

Miramichi River Drainage

- Little Bartibog River - important trout spawning and nursery area;
- Bartibog River - important for searun trout and fall run of salmon; spawning area near Highway 8;
- Green Brook - very important for searun trout;
- Campbell Brook - important for searun trout;

Tabusintac River Drainage

- Eskedelloc River - trout and salmon;
- Tabusintac River - important for trout and salmon spawning;
- Maliaget Brook - a few trout only;

Bathurst to Belledune:

Nepisiguit River Drainage

- Nepisiguit River - trout and salmon;
- Pabineau River - important for trout and salmon spawning;
- Middle River - good areas for salmon and trout spawning and nursery areas;
- Tetagouche River - mostly trout;

Millstream River Drainage

- Millstream River - trout;

Nigadoo River Drainage

- Eel Brook - minor importance for trout;
- Paynes Brook - trout only;
- North Branch Nigadoo River - trout and juvenile salmon;

(Continued)

TABLE B-7: SUMMARY OF SIGNIFICANCE OF WATERCOURSES AS FISH HABITAT ALONG THE STUDY CORRIDOR (COMPLETED)

- South Branch Nigadoo River - trout and salmon;
- Nigadoo River - trout and salmon;

Jacquet River Drainage

- Antinouri Lake - important recreational sport fishery;

Belledune River Drainage

- Belledune River - minor importance for trout.

SOURCE: J. Gilbert, DNRE (pers. comm.)

which have lost the tendency to go to sea; these fish complete their life cycle in freshwater. Relatively large cool rivers with extensive gravelly bottom headwaters are essential during early life (Scott and Scott 1988). Adult fish enter the natal stream from late May until early November. Mature fish spawn in the fall (mid-October to mid-November) with the female excavating a gravel nest or "redd" in shallow riffle areas.

Following spawning, which occurs in November, the "spent" adults overwinter in areas of deep, slow flowing water, and return to sea the following spring as "kelts" or "black salmon". Their survival rate is low and multiple spawners usually comprise a very small proportion of the spawning population of a river.

Salmon represent a heavily exploited, valuable resource. While at sea they are exploited by commercial fisheries. In freshwater, sport fisheries abound and anglers regard Atlantic salmon as a superb challenge. Most effort is directed at "bright" salmon which have entered freshwater to await spawning. Fishing for "black salmon" or "kelts" is popular in some rivers as well.

In New Brunswick and throughout much of its range, local salmon stocks are declining due to over-fishing and habitat destruction. Potential production levels have not been realized since the 1930s primarily due to the combined effects of over exploitation by various domestic and foreign fisheries (Hooper and Cronin 1981). Other factors include water quality deterioration, habitat damage, and loss of fitness and/or depletion of genetic variation in natural populations. By 1981, the rivers of New Brunswick were considered to be producing juvenile salmon at only 55 to 60 percent of their potential (Hooper and Cronin 1981).

Brook Trout

The brook trout is also an anadromous species native to the study corridor and found throughout eastern North America (Scott and Scott 1988). Anadromous populations co-exist with "resident" or non-sea-run populations. Streams with gravel, or rocky bottoms and patches of silt in slow-moving sections, usually with alder or cedars growing along the banks, are typical brook trout waters. Many brook trout feed in the sea for at least two to three months and return to freshwater during the summer to spawn later in the fall. Some brook trout in a population will not descend to the ocean and instead remain in freshwater. In New Brunswick brook trout spawn in late summer and fall. After hatching in the spring, the young remain in the gravel until the egg yolk is absorbed when they emerge from the gravel. Growth rates tend to be faster in New Brunswick than in areas further north such as Labrador, yet these faster-growing populations tend to be short-lived, with a maximum age of five to six years. Brook trout consume a wide variety of invertebrate and vertebrate animals.

The brook trout is a popular game fish throughout the study corridor and angling occurs on most accessible streams (from May 1 to September 15 in 1989) (DNRE 1989).

B.1.10 Endangered and Threatened Species

In 1974 New Brunswick passed legislation recognizing a species of animal or plant as "endangered" if it is threatened with extinction because of the destruction of its habitat, disease, over-exploitation, predation and the use of chemicals. At the present time six species are declared endangered under the New Brunswick **Endangered Species Act**. They are:

- eastern cougar (*Felis concolor*);
- lynx (*Lynx lynx*);
- bald eagle (*Haliaeetus leucocephalus*);
- osprey (*Pandion haliaetus*);
- peregrine falcon (*Falco peregrinus*); and
- Furbish's lousewort (*Pedicularis furbishiae*).

Three of these species are also on the Canadian list of endangered species (COSEWIC 1989), status as follows:

- eastern cougar (endangered);
- peregrine falcon, subspecies *anatum* (endangered), and subspecies *tundrius* (threatened); and
- Furbish's lousewort (endangered).

COSEWIC (1989) defines an endangered species as follows:

> **any indigenous species of fauna or flora that is threatened by imminent extirpation (removal of all members of a population from Canada) or extinction throughout all or a significant portion of its Canadian range owing to human action.**

COSEWIC (1989) defines a threatened species as follows:

> **any indigenous species of fauna or flora that is likely to become endangered in Canada if the factors affecting its vulnerability do not become reversed.**

Furbish's lousewort is found only along the Saint John River in the western part of New Brunswick and Northeastern Maine (Clayden, et al. 1984), so it is not likely that it occurs along any portion of the proposed route. Centres of rare plant concentrations will be discussed in Section B.1.11.

The American Fisheries Society (AFS) Endangered Species Committee have placed taxa of fishes from the United States and Canada into categories of Protected or Special Concern. None are listed for the Province of New Brunswick (Johnson 1987).

B.1.10.1 Eastern Cougar

The cougar is considered to be an endangered species in Canada, and in New Brunswick, where the largest presumed population of eastern cougars (van Zyll de Jong and van Ingen 1978) has been protected since 1976 under the **Endangered Species Act** (Clayden, et al. 1984). Clayden, et al. (1984) suggest that the cougar has probably never been common in New Brunswick. The Canadian Wildlife Service has collected close to 300 reports of cougar sightings in New Brunswick and Nova Scotia since 1977 (B. Johnson, pers. comm.), but the number of cougars in these Provinces is not known. The cougar is found in a wide variety of habitats across North America, indicating that it is an adaptable species capable of living both in wilderness areas and also close to man (Parker 1983). Van Zyll de Jong and van Ingen (1978) suggest that the two most important factors affecting cougar distribution and abundance are the density of prey, and the density of human populations.

Cougar populations may be recovering as deer populations increase and expand their range when second growth forests replace logged-out mature forests (Macey 1979). Much of eastern Canada, however, is marginal deer range and severe winters may have drastic effects on deer populations, which can critically reduce the cougar's food supply (Macey 1979).

B. Johnson (pers. comm.) has provided the locations of fourteen sightings since 1977 in the vicinity of the study corridor. These have occurred in the east Canaan to Forks area of Highway 112, northwest of Salisbury (3); the Rogersville to Semiwagan Ridge area (2); Blackville on the Southwest Miramichi River (1); Lyttleton on the Northwest Miramichi River (1); Maple Glen, west of Newcastle (1); Highway 8 north of Bartibog (3); Salmon Beach, northeast of Bathurst (1); and Narrows Brook, south of Campbellton (2).

B.1.10.2 Lynx

The lynx is a rare species in New Brunswick and since 1976 has been protected under the Provincial **Endangered Species Act** (Clayden, et al. 1984). COSEWIC (1988) lists the lynx population of New Brunswick as low to rare, and remnant, although the population in neighbouring Gaspé is high. The lynx is the only wild felid found in the boreal forest of Canada (Parker, et al. 1983).

Clayden, et al. (1984) stated the lynx is vulnerable to increased human activity in wilderness areas, especially to illegal shooting or trapping. A few lynx are trapped incidental to the regular target species (COSEWIC 1989, citing Cartwright, pers. comm.). Breeding rates and recruitment have been shown to decline in response to low snowshoe hare populations, as the populations of lynx throughout their range in North America is closely tied to the cyclic abundance of hares; dependence on hares declines during the summer, but they remain the single most important prey species (Parker, et al. 1983).

In a study conducted in Cape Breton Island, lynx were found to select regenerating mixed forest habitats approximately twenty years after cutting; this is also optimal snowshoe hare habitat (Parker, et al. 1983). Optimum habitat in the Cape Breton highlands was found to be a mosaic of mature conifer (50 percent), mature mixed woods (30 percent), and successional (12 percent), as above; the remainder (8 percent) was a mixture of bogs, alder swales, streams and ponds (Parker, et al. 1983). Any creation of habitat through forest harvesting and burning will create habitat for snowshoe hares, and will thus benefit lynx. Lynx in Cape Breton Island have also declined in lowland areas due to the colonization of that habitat by the bobcat (Parker, et al. 1983).

B.1.10.3 Bald Eagle

Abundance and Distribution

This large fish-eating raptor breeds across North America from northwestern Alaska and central Canada east to Newfoundland, and south to the southern United States. They winter from Alaska and southern Canada, southward to, or beyond, the southern limits of the breeding range (Godfrey 1986).

The bald eagle has been listed as endangered in New Brunswick under the Provincial **Endangered Species Act**. The species is now making a moderate comeback after populations were reduced by pesticides over the last several decades (Farrand 1983).

There are three different populations of bald eagles in New Brunswick: breeding; summering; and wintering. *H. l. alascanus*, the northern subspecies, is the breeding subspecies of New Brunswick and is also an uncommon year-round resident. The slightly smaller *H. l. leucocephalus*, the southern subspecies, is a non-breeding summer visitor (May to October) from the southeastern United States population (Godfrey 1986; Clayden et al. 1984; Farrand 1983), which has recently declined (Stocek 1979). Eagles wintering in New Brunswick belong to the resident population (Stocek 1979) and are concentrated along the coastline of Charlotte County and the lower Saint John River (Clayden, et al. 1984), where they number no more than three or four dozen (Stocek 1988).

The bald eagle was probably never a common breeding bird in New Brunswick (Stocek and Pearce 1981, citing Moore 1928). Between 1900 and 1949, there are records for only 30 nestings. Between 1950 and 1973, there were only 75 nest records, with no more than five noted in any one year (Stocek and Pearce 1981). Between 1970 and 1980, 22 occupied sites were identified in the Province, with a maximum of 12 (0.02 per 100 km^2) active in any one year (Stocek and Pearce 1981). There were over 30 nesting pairs in the Province in 1988, and breeding success has been getting progressively better (Stocek 1988).

In Northumberland County, eagles have nested for thirty years at one site along the Tabusintac River; the extensive Miramichi watershed has supported only a few nesting pairs, as recent as the 1950s (Stocek and Pearce 1981). There have been no nests along the Southwest and Northwest Miramichi Rivers until recently (R. Stocek, pers. comm.).

In a study conducted from 1974 to 1980, Stocek and Pearce (1981) found a nest site on the Tabusintac River, Northumberland County. This site, which was last occupied in 1975, was the most northerly and easterly bald eagle nest in the Province at that time (R. Stocek, pers. comm.). Recently fledged young indicating a probable nest site, were discovered during the summer of 1989 at Beaubears Island (R. Stocek, pers. comm.). This is located on the Miramichi River at Newcastle. This site was occupied again in 1990 (R. Currie, pers. comm.).

Northern bald eagles move to the breeding sites in February and March; mating is underway by mid-March, and the peak of egg laying occurs in early April (Stocek 1983). Young are present on the nests from late May to mid-August with peak fledging in late July (Stocek 1983). Human activity on lakes and rivers usually commences in early June; by then, eggs have hatched and the chances of nest desertion are reduced, although snowmobiling and winter cutting in some areas may cause disturbance early in the breeding cycle (Stocek 1981). Birds return to the coast late in the fall (Stocek 1979).

Habitat Relationships

Bald eagles are usually found in the vicinity of larger rivers, lakes, and coastal waters. Birds which nest in marine environments, i.e., along coastal areas, appeared to be more successful than those occupying lake and river breeding sites (Stocek and Pearce 1981). With the exception of the Miramichi River, the suitability of the study corridor as bald eagle habitat is extremely limited.

Limiting Factors

Factors limiting the population of bald eagles in North America have been reviewed by Fraser (1983). These factors are occurring on a continent-wide basis, and include:

- shooting;
- pesticide poisoning;
- loss of habitat (cutting of nest trees, forest harvesting, destruction of perches and winter roosts, degradation of foraging sites); and
- human disturbance near nest sites, especially by people on foot.

Limiting factors associated with human disturbance have been summarized by Fraser (1983). Pedestrian traffic is apparently more disturbing than automobile traffic and auditory stimuli. Boat traffic has been variously described as having little effect to being very disturbing.

B.1.10.4 Osprey

The osprey is widely distributed throughout North America (Godfrey 1986), but in New Brunswick it is listed as endangered under the Provincial **Endangered Species Act**. However, the species has increased in abundance and is now considered to be reproductively stable or even expanding. Therefore it is now common enough to warrant delisting (R. Stocek, pers. comm.; Clayden, *et al*. 1984; Stocek and Pearce 1983). Between 1974 and 1980, there were 133 occupied nests in New Brunswick, of which 81 (61 percent) were successful (Stocek and Pearce 1983).

Osprey frequent lakes, large rivers, and coastal bays (R. Stocek, pers. comm.), including the Tabusintac Bay and River, Miramichi Inner Bay and Kouchibouguac National Park; however, the species is relatively uncommon inland in comparison with the coastal regions (Stocek and Pearce 1983).

A total of 74 active nests were located on NB Power transmission line structures as of the end of June, 1989 (NB Power, pers. comm.). Most of these were located on line #1104, Fredericton to Coleson Cove (11 nests); line #1105, Grand Lake to Newcastle (14); and line #1125, Fredericton to Beechwood (13).

Osprey feed almost entirely on live fish, caught by diving from the air. Breeding habitat suitability is consequently dependent on easy access to an abundant fish population (Vana-Miller 1987). In addition to fish standing stock, water clarity and the amount of surface water obstruction influence the suitability of foraging habitat. Because of the improved visibility of fish in still water, lakes and reservoirs often provide better foraging opportunities than rivers.

Availability of suitable nest sites, minimal disturbance from human activities, and proximity to foraging areas are considered to be important attributes of osprey nesting habitat (Vana-Miller 1987). Tall dead snags or large trees surrounded by water provide preferred nest sites, although ospreys will occupy a variety of nest sites including certain types of transmission line structures. Nesting on transmission lines occurs in all provinces and territories (Stocek 1981). Stocek (1981) reports at least 189 osprey nest on power structures in eight provinces each year, and that most of these are in the Atlantic region; densities reported in this region are 0.69 pairs per 100 km^2, compared to 0.17 nesting pair per 100 km^2 nationally.

B.1.10.5 Peregrine Falcon

The peregrine falcon is considered an endangered species nationally and internationally and is protected in New Brunswick by the **Endangered Species Act** (Clayden, et al. 1984). During spring and fall, migrating peregrines are seen most frequently along the lower Saint John River valley, the Bay of Fundy coastline and in the Grand Manan archipelago. The Canadian Wildlife Service is currently attempting to re-establish a breeding population of peregrine falcons in eastern Canada. In 1982 a program was begun to re-introduce young peregrines to Fundy National Park, New Brunswick; the first successful nesting occurred in 1989 (Christie 1989). To date more than 45 birds have been released in the Park. The goal is to have 15 pairs of peregrines nesting in Atlantic Canada. A pair successfully nested in Saint John in 1989. Environment Canada (1987a) suggests that peregrines are the victims of DDT, a pesticide now banned in North America but still used in Central and South America. The taking of young for falconry, collecting of eggs, disturbance at nesting sites and shooting have also caused numbers to decline.

B.1.10.6 Rare Species

COSEWIC (1989) defines a rare species as:

> **any indigenous species of fauna or flora that, because of its biological characteristics, or because it occurs at the fringe of its range, or for some other reasons exists in low numbers or in very restricted areas in Canada, and so is vulnerable, but is not a threatened species.**

The eastern bluebird (*Sialia sialis*) is one rare species which occurs in low numbers in the Province (COSEWIC 1989).

Eastern Bluebird

The eastern bluebird is a bright blue thrush with a red breast which inhabits open and sparse woods, woods edges, burned areas with standing trees, orchards and farmland; nesting habitat requires the presence of suitable natural cavities in trees. The species will readily nest in nest boxes set up along roads. Recently, eastern bluebirds have been found nesting in clear-cuts throughout New Brunswick, well away from settled areas (Kimball 1989; P. Pearce, pers. comm.).

B.1.11 Environmentally Significant Areas

Legislation for setting aside areas of particular environmental significance in New Brunswick was enacted in 1975 with the **Ecological Reserves Act**. To date, 65 sites in the Province have been recommended for preservation (Wein and Speer 1975; Wein and Jones 1975) and three have been officially declared ecological reserves. None of these are in the study corridor.

More recently, Dionne, et al. (1988) has compiled a list of "critical natural areas" in New Brunswick. While these areas do not have official status in the Province, they have been defined by a group called the New Horizons Critical Natural Areas Committee as sites that possess "unique or especially distinctive natural features of biological, ecological, geological or aesthetic value" (Dionne, et al. 1988).

There are six of these environmentally significant areas (ESAs) within the study corridor:

- Quinn Point, on the bay of Chaleur north of Culligan between Little Belledune Point and Armstrong Brook; this privately owned site is noted for shoreline deposits which are several hundred metres thick and which are particularly rich in invertebrate fossils of the Silurian period;
- Pabineau Falls, on the Nepisiguit River south of Bathurst, and owned by Consolidated Bathurst Inc., has scenic value (the Nepisiguit River is forced through a narrow gorge), and also has value for sport fishing; the ESA is also the site of three rare grass species, one of which has been collected only at Pabineau Falls;
- the mouth of Stewart Brook, on the south bank of the Northwest Miramichi River between South Esk and Derby Junction, is a tidal marsh which is the site of four rare plant species, most of which are found only at that site;
- Bathurst Harbour, site of a colony of ring-billed gulls (*Larus delawarensis*);
- Peter's River Marsh, Youghall, on the northwest shore of Bathurst Harbour, site of three species of rare butterflies; and

- the mouth of the Tetagouche River, on the west side of Bathurst Harbour, site of a rare plant (*Aster subulatus* var. *obtusifolius*).

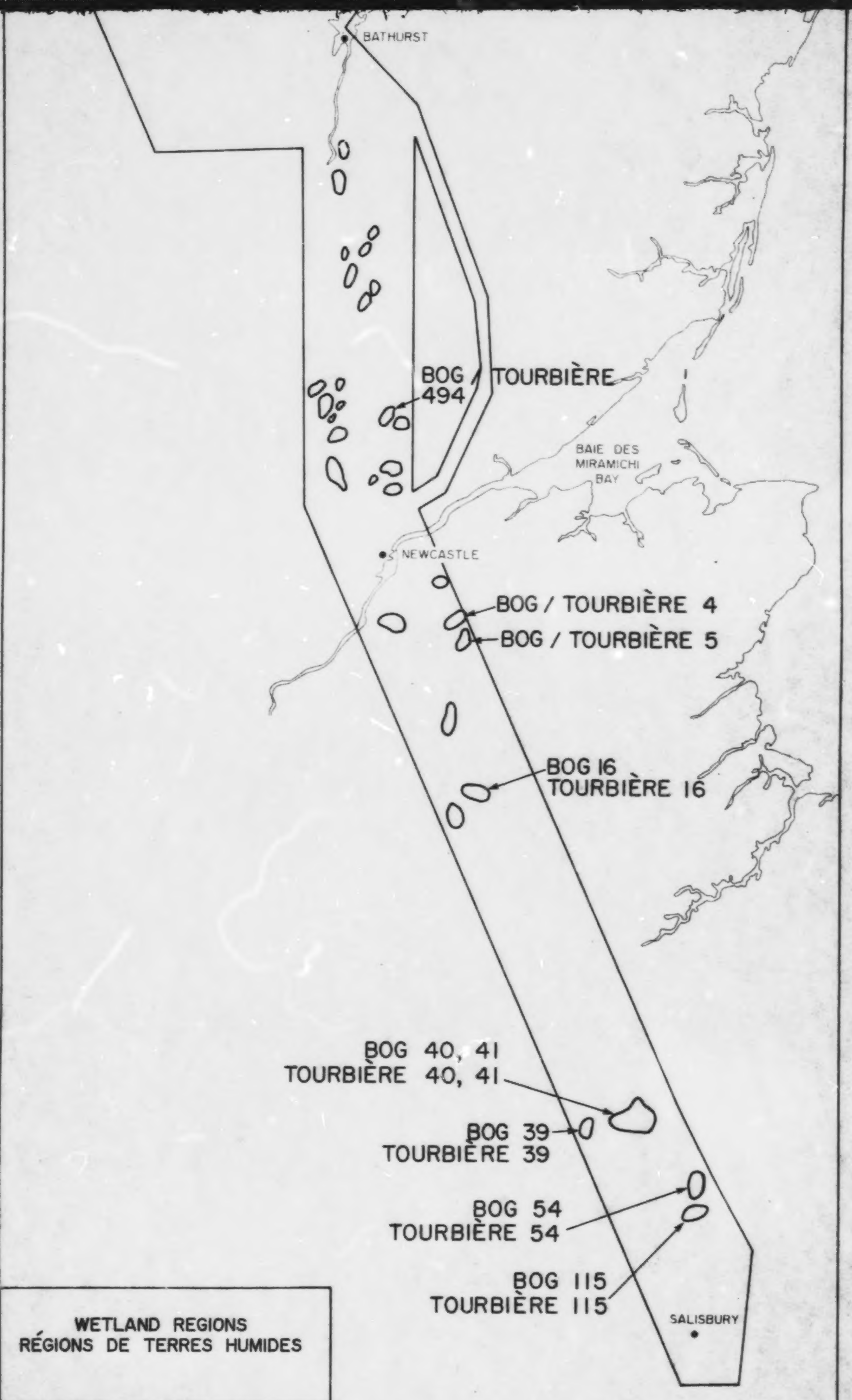
B.1.12 Wetlands

The location and ratings of the wetlands in the corridor were determined by consulting the New Brunswick Wetlands Atlas (Environment Canada 1987b) and Hudgins (1983) which relies on the classification system developed by Golet (1972).

In New Brunswick, only those wetlands with a ranking of 60 of a maximum score of 108 under the Golet System (Golet 1972) are identified on the New Brunswick Wetlands Atlas, although all wetlands are mapped. The absolute value of a score is meaningless unless the wetland is considered in relation to all the others in the region. Within the corridor, wetlands with scores between 60 and 80 are relatively common, while those of greater than 80 are uncommon. There are none with scores greater than 90 within the corridor.

Extensive regions of wetlands are situated from north to south as follows (Figure B-7):

- west of the rail line south of Bathurst, between Bartibog Station and Bruce;
- the east side of the corridor, from Newcastle north to Beaverbrook Station, including Bog 494;
- Chaplin Island Road north to the Middle Branch Bartibog River;
- the east side of the corridor between Murray Settlement and Chatham Air Force Base, including Bogs 4 and 5;
- north of Collette;
- south of Rogersville, including Bog 16;
- the Birch Ridge (Bogs 40 and 41) and Selick bogs in the west and central portions of the corridor between Coal Branch and Hebert; and
- Bogs 54 and 115 near Gallagher Ridge.


BATHURST
BOG / TOURBIÈRE 494
BAIE DES MIRAMICHI BAY
NEWCASTLE
BOG / TOURBIÈRE 4
BOG / TOURBIÈRE 5
BOG 16
TOURBIÈRE 16
BOG 40, 41
TOURBIÈRE 40, 41
BOG 39
TOURBIÈRE 39
BOG 54
TOURBIÈRE 54
BOG 115
TOURBIÈRE 115
SALISBURY

WETLAND REGIONS
RÉGIONS DE TERRES HUMIDES

wms associates ltd.
ENVIRONMENTAL CONSULTANTS AND PLANNERS
wms associés ltée
AMÉNAGISTES ET PROFESSIONNELS DE L'ENVIRONNEMENT

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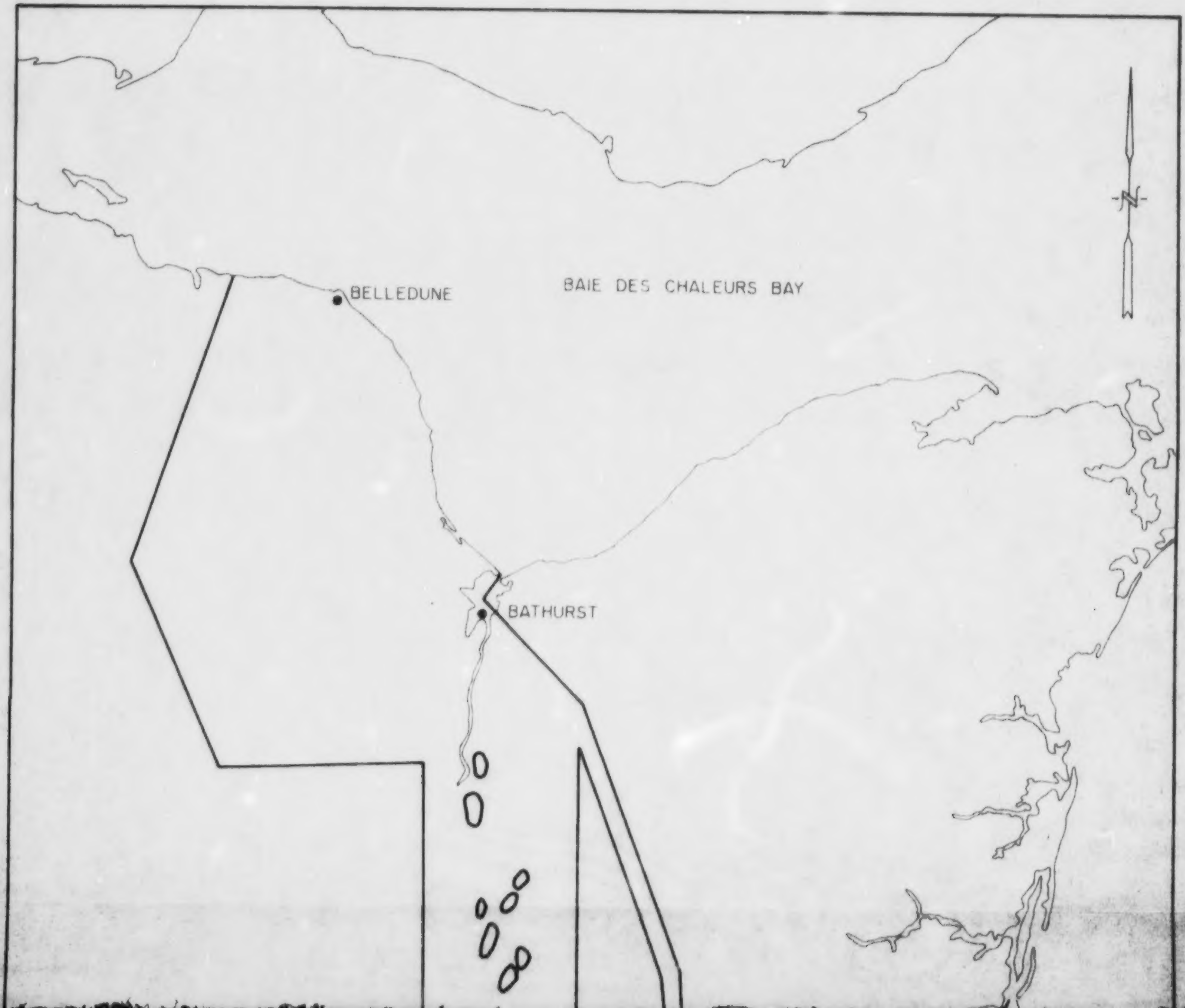

BELLEDUNE
BAIE DES CHALEURS BAY
N
BATHURST

Table B-5 provides a summary of the wetlands occurring within and contiguous with the study corridor; several wetlands are very large and extend beyond the study corridor. Between Salisbury and Newcastle, the wetlands are relatively large, with some being in the neighbourhood of 500 ha; this is also reflected in the total area of 3,952.8 ha. The average Golet score is relatively high, at 70.5. Wetlands in the Newcastle to Bathurst area are on average smaller (66.6 ha), and the total area is also considerably less. Wetlands in the Bathurst to Belledune area are smaller averaging 17.8 ha and the smallest total area (887.9 ha).

Ducks Unlimited Canada provided a list of completed projects and potential project sites which are under active consideration (P. Hansen, pers. comm.); many of these projects are in Kent County. Ducks Unlimited Canada does not publish the location of its wetland projects without the prior approval of the landowners. However, there are 19 completed or proposed Ducks Unlimited projects in the study corridor. Eleven of these are in Kent County, three are in Gloucester County, two each are in Northumberland and Restigouche Counties, and one is in Westmorland County; they range in area from 15 to 127 ha.

B.1.13 Air Quality

B.1.13.1 Ozone

Ozone (O_3) is the principal component of several oxidizing gases known as total oxidants (Eaton, et al. 1986). Ozone is not emitted directly from a major source but forms as a secondary pollutant (Eaton, et al. 1986). Ozone is a consideration in association with energized transmission lines which produce it in small quantities. The following discussion describes ground level ozone in New Brunswick.

Ozone is measured daily at two air quality stations in Saint John and seasonally at three rural stations. Annual ozone concentrations in Saint John have been slowly increasing with the 1988 annual ozone levels at Forest Hill and the Post Office measuring 58.6 $\mu g/m^3$ and 48.0 $\mu g/m^3$ respectively. Both levels exceed the acceptable guideline of 30 $\mu g/m^3$ annually (NBDOE 1989).

The ozone concentrations in Saint John may be taken as a Provincial average, as it falls between the seasonal averages of 44.2 $\mu g/m^3$ and 79.4 $\mu g/m^3$ at Central Blissville and Lepreau, respectively (NBDOE 1989).

B.1.14 Surface Water Quality

There are no permanent water quality monitors in the study corridor as the New Brunswick Department of Environment has no permanent monitors in the Province. However, 20 permanent monitors are being planned in a collaborative effort with the federal government. Once in place, these monitoring stations will be surveyed every six to eight weeks. The New Brunswick Department of the Environment does have a number of intermittent survey stations throughout the Province.

The New Brunswick Department of Environment maintains a listing of lake and river survey data for the Province, which has been carried out from the mid-seventies to the present. If a surveyed river is found to be of good or excellent quality, it may not be surveyed again for three to four years. If, however, it is found to be of poor quality, it may be surveyed on a regular, i.e., yearly, basis.

All major rivers which cross the study corridor have been monitored in the past, with the exception of the Coal Branch Stream, the data for which are presently unavailable (J. Choate, pers. comm.).

Those rivers which have had survey stations within the study corridor include:

- the Petitcodiac River;
- the North River;
- the Richibucto River;
- the Kouchibouguacis River;
- the Kouchibouguac River;
- the Miramichi River, including stations on the Northwest Branch, Southwest Branch, and estuary;
- the Bartibog River;
- the Tabusintac River;

- the Nepisiquit River;
- the Little River;
- Bathurst Basin;
- the Middle River; and
- the Tetagouche River.

In total, 15 stations within the study corridor have been surveyed by the New Brunswick Department of Environment (unpublished data) for water quality parameters including:

- turbidity;
- heavy metals, i.e., mercury, iron, copper, zinc;
- pH;
- nutrients, i.e, phosphorus, nitrogen, carbon;
- acidity, i.e., Cl^-, SO_4^-, PO_4^-, HCO_3;
- specific conductivity; and
- coliform bacteria.

The water within the study corridor is typically within the Canadian Drinking Water Standards (CCREM 1987) and of generally good quality (J. Choate, pers. comm.). From Salisbury to Newcastle, the water is of good quality (Environment New Brunswick 1980). Some rivers from the Miramichi River to the northern limits of the study corridor which have been observed to have poor water quality include:

- the Miramichi River, polluted with pulp mill wastes (J. Choate, pers. comm.);
- the Nepisiquit River, polluted with mining waste (J. Choate, pers. comm.); and

- the Little River, highly acidified by mining (J. Choate, pers. comm.; Westlake and Gauthier 1983).

Surface water quality data has been collected over a long period of time at a number of stations within the vicinity of the corridor (Table B-8). The surface water of these areas is primarily riverine. Lakes comprise only a very small percentage of the drainage basins, estimated at less than 0.25 percent for the Southwest Miramichi River, for example.

Some of the sampling stations show high levels of iron approaching the recommended limits for acceptable drinking water (CCREM 1987). As described in (Section B.1.5.2), in areas of Pennsylvanian or younger rocks, iron and manganese often occur above the recommended standards of 0.3 and 0.05 mg/L respectively.

Areas within the corridor with little or no development can expect the existing water quality to be good.

B.2 Socioeconomic Setting - Study Corridor

This Section describes the socioeconomic setting of the study corridor as the basis for the Route Selection Study. The socioeconomic environment is defined as a description of how people live, how they earn their livelihoods and the physical, cultural and social context in which these activities occur.

Section B.2.1 provides a regional economic overview which describes the local government structure, population, housing, employment, income, industrial structure and economic base, transportation networks, existing transmission lines and watersheds. Section B.2.2 provides a study corridor overview of recreational and commercial activities, and communities which could be potentially affected by the construction of a transmission line.

B.2.1 Regional Socioeconomic Overview

The spatial boundaries of the region in which potential socioeconomic impacts may occur as a result of the development of the transmission line are complex. Public activities within the study corridor are largely conducted by the residents of Albert, Westmorland, Kent, Northumberland, Gloucester and Restigouche Counties. Information related to activities is collected at the Parish and incorporated communities level within these Counties. The Parish/incorporated communities also serve to define distinct socioeconomic units. In this

TABLE B-8: RECENT WATER QUALITY PARAMETERS OF MAJOR RIVER SYSTEMS ALONG STUDY CORRIDOR

River (Date Sampled)	Turbidity		Nutrients (Total) (mg/L)			Heavy Metals (Extractable) (mg/L)			
	(NTU)	pH	Phos.	Nit.	Org.Carbon	Hg	Fe	Cu	Zn
Petitcodiac***** (1975-1979)	30*	7.4	.091	0.30	6.	–	–	–	–
North***** (1975-1979)	58*	7.1	.046	0.24	13.5	.0001	–	.01	.04
Richibucto (84/08/27)	5.11	7.33	.07	0.51	9.16	–	.394	.01	.01
Kouchibouguacis (84/08/27)	1.11	7.22	.07	0.45	13.9	–	.492	.01	.01
Kouchibouguac (84/08/27)	2.02	7.0	.07	0.42	12.0	–	.518	.01	.01
Miramichi									
-Southwest Br. (89/10/25)	3.2	7.045	.087	1.04	8.05	–	1.48	3.15**	–
-Northwest Br. (89/12/11)	9.3	6.786	.190	1.27	8.03	–	3.67	–	–
-Estuary (89/09/15)	6.2	7.25	–	–	–	–	–	7.10**	–
Bartibog (86/08/16)	0.7	7.93	–	0.22	5.0	–	.156	.011	.01
Tabusintac (86/08/16)	1.0	7.69	–	0.40	11.0	–	.231	.012	.01
Middle (86/08/16)	0.5	7.62	–	0.21	6.67	–	.086	.019	.01
Tetagouche (86/08/16)	0.5	7.87	–	0.17	3.76	–	.050	.017	.01
Little (82/08/17)		3.0				0.18***	–	<.01	5.6
Nepisiguit**** (1970-1972)		6.5				–	.435	.033	.177

Note: Phos. = Phosphorus; Nit. = Nitrogen; Org.Carbon = Organic Carbon
* = Apparent Color
** = µg/L
*** = Total Metal µg/G Dry Weight, average for nine sites in Bathurst Basin, surficial sediments sampled 83/06.
**** = average value for three years sampled
***** = median value

SOURCE: Environment New Brunswick (1980); Hildebrande (1984); Westlake and Gauthier (1983); New Brunswick Department of Environment, unpublished data.

regional overview, three socioeconomic units are considered: the Salisbury to Newcastle region, the Newcastle to Bathurst region, and the Bathurst to Belledune region.

B.2.1.1 Settlement Patterns

The communities described in this section are shown in Figure 1-1 and in Maps 1-8.

Salisbury to Newcastle

The northern portion of the Salisbury to Newcastle and southern portion of the Newcastle to Bathurst sections of the study corridor are primarily located within the area known locally as the "Miramichi". These two portions are under the jurisdiction of the Miramichi Planning District.

The southern tip of the study corridor is located within the Counties of Albert and Westmorland. It lies specifically within the Parish of Coverdale near Petitcodiac and Salisbury.

Settlement in the Salisbury to Newcastle region has primarily occurred in three villages (Salisbury, Rogersville, and Nelson-Miramichi) and is also concentrated along transportation networks.

The Village of Salisbury is becoming increasingly a bedroom community to the City of Moncton. Settlement is concentrated within the core of the Village, but is spreading eastward towards Moncton along Routes 106 and 112. The east side of Salisbury is becoming very residential, with at least two subdivisions being developed recently. West and north of the Village are areas of agriculture. Salisbury is a noted centre for fox farming in New Brunswick.

The Village of Rogersville is a small local centre with an economic association with the Newcastle-Chatham area. Settlement is concentrated at the junctions of Route 126 and four east-west roads. Single-family residences occur in relatively dense strip settlements along these roads.

The remainder of the settlements north of Salisbury occur in smaller hamlets and ribbon-style development along Route 126 between Moncton and Newcastle, and along connecting highways. These settlements are situated at the junctions of highways between Route 126 and the coast; there is very little settlement west of Route 126 toward the interior.

The Village of Nelson-Miramichi is part of an almost continuous and relatively dense settlement of the south shore of the Miramichi River. It is within the Newcastle-Chatham economic community which includes the Local Service Districts of Nelson, Douglasfield, Chatham and Chatham Head. For the most part, the Town of Chatham is situated to the east of the study corridor with only a very small portion of the western portion of the Town on the eastern edge of the study corridor. Because of the small portion of area involved, the Town of Chatham is not included in subsequent regional analysis. The north and south shores of the Northwest and Southwest Miramichi Rivers have roadways along which are a fairly dense strip of smaller hamlets and ribbon-style development.

Newcastle to Bathurst

The northern portion of the Newcastle to Bathurst section of the study corridor is primarily located within the area known as the "Chaleur Region".

More specifically, settlement in the Newcastle to Bathurst region has primarily occurred in the city of Bathurst, the Town of Newcastle, the Village of Douglastown, and is also concentrated along the major transportation network of the area.

Settlement along the north shore of the Miramichi River is much the same as along the south shore with a densely populated urban centre in Newcastle with a transition to a fairly dense strip settlement away from the Town along the major highways. The settlement pattern radiates from the economic area west to Northwest Bridge and Strathadam, northwest to Maple Glen, Cross Roads (site of the terminal station) and Chaplin Island Road, north to Patterson Siding and Telly Road Crossing, and northeast along Route 8 to the Bartibog area.
Route 8 is contained within a separate 2 km corridor, and contains several strip settlements along its length. Settlements include Little Bartibog, Bartibog, Jeanne Mance, Daulnay and Allardville and Allardville Centre LSDs. The densely populated portion of Allardville Centre LSD is located at a highway junction.

Most of the land within the corridor between Telly Road Crossing and the area south of Bathurst is uninhabited.

Bathurst to Belledune

Settlement in the Bathurst to Belledune region has primarily occurred in the Town of Beresford, the Villages of Nigadoo, Petit-Rocher, Pointe-Verte, and Belledune and along the coast of the Bay of Chaleur.

Most of the settlement is situated along the coast of the Bay of Chaleur from Bathurst north and west to the edge of the study corridor. Strip settlement occurs along roads situated north and south of the Little River, Tetagouche River the Millstream River, Nigadoo River, and others, all extending westwards to the interior, and along north-south connecting roads. Route 134 along the coast is densely populated in a continuous strip, especially at the locations of the Villages and the Town of Bathurst. Many of the communities in this expanding area exist as bedroom communities to Bathurst.

B.2.1.2 Local Government Structure

The 117 incorporated municipalities in New Brunswick are governed by a Mayor and Council who serve as the elected representatives of citizens within defined administrative boundaries.

Incorporated municipalities provide the services deemed by the council to be appropriate for the peace, order, and good government of the community and for promoting the health, safety and welfare of its inhabitants. These services include utilities, transportation, police and fire protection, and other general government services.

The Salisbury to Newcastle region (north to the Northwest Miramichi River) includes the Villages of Salisbury, Rogersville and Nelson-Miramichi, and 18 LSDs (portions of 17 LSDs: Coverdale, Moncton, Salisbury, Harcourt, St-Paul-de-Kent, Weldford, Huskisson, Acadieville, St-Louis, Rogersville, Glenelg, Nelson, Southesk, Derby, Douglasfield, Chatham and Chatham Head, and the entire LSD of Collette).

The Newcastle to Bathurst region (north of the Northwest Miramichi River) includes the city of Bathurst, the Town of Newcastle, the Village of Douglastown, and six LSDs (Nordin, Newcastle, North Esk, Allardville, Allardville Centre and Bathurst.)

The Bathurst to Belledune region includes the Town of Beresford, the Villages of Nigadoo, Petit-Rocher, Pointe-Verte, and Belledune, and eight LSDs (North Tetagouche, Armstrong Brook, Petit-Rocher Nord, LaPlante, Petit-Rocher Sud, Robertville, Beresford and Durham.)

B.2.1.3 Population and Housing

Salisbury to Newcastle

The population of the Salisbury to Newcastle region for 1981 and 1986 is shown in Table B-9. The population in 1986 was 31,852, an increase of 2.4 percent from 1981. The Coverdale Parish experienced the largest increase in population between 1981 and 1986 (12.2 percent) whereas the population of the Glenelg Parish decreased by 137 people or 6.7 percent during this period. One-third of the 17 Parishes and municipalities in the region decreased in population and the other two-thirds increased between 1981 and 1986. The change in population was relatively small for most of the parishes and municipalities with only five of the 17 areas experiencing a population change of more than five percent. In addition, the population is basically rural in nature; the population within the incorporated municipalities in the region (Salisbury, Rogersville, Nelson-Miramichi) accounting for only 13.9 percent of the 1986 population. This rural/urban ratio is down slightly from the 14.0 percent noted in the 1981 Census period.

Newcastle to Bathurst

The population in the Newcastle to Bathurst region for the Census years 1981 and 1986 is shown in Table B-10. The total population of this region in 1986 was 33,206, a decrease of 2.2 percent from 33,955 in 1981. The largest increase in population between 1981 and 1986 occurred in the Bathurst Parish, whose population increased 12.4 percent. The Town of Newcastle experienced the largest decrease in population, 7.6 percent, over this period. This region is primarily urban in nature; incorporated municipalities account for over 65 percent of the population mainly due to the inclusion of the City of Bathurst and the Town of Newcastle. However, the proportion of people living in incorporated municipalities has decreased by almost three percent since the 1981 Census period.

Bathurst to Belledune

The population in the Bathurst to Belledune region for the Census years 1981 and 1986 is shown in Table B-11. The total population of the region in 1986 was 18,101, which represents an increase of 1.5 percent from 1981. The largest increase in population, 5.7 percent, occurred in the Village of Beresford; the largest decrease in population, 4.6 percent, occurred in the Village of Belledune. However, half of the areas experienced a decrease in population during this period. The region is evenly split between urban and rural areas with the population of the incorporated municipalities representing 50.0 percent of the total population of the region in

TABLE B-9: SALISBURY TO NEWCASTLE, POPULATION, 1981, 1986

	1981	1986	Change	% Change
Acadieville (P)	1,045	1,039	-6	-0.6
Chatham (P)	3,732	3,776	44	1.2
Coverdale (P)	3,064	3,437	373	12.2
Derby (P)	1,187	1,168	-19	-1.6
Glenelg (P)	2,055	1,918	-137	-6.7
Harcourt* (P)	558	527	-31	-5.6
Nelson (P)	1,059	1,068	9	2.6
Nelson-Miramichi (V)	1,452	1,407	-45	-3.1
North Esk (P)	2,880	2,802	-78	-2.7
Rogersville (P)	1,463	1,523	60	4.1
Rogersville (V)	1,237	1,273	36	2.9
St. Louis (P)	1,928	2,070	142	7.4
St. Paul (P)	1,069	1,075	6	0.6
Salisbury (P)	3,158	3,479	321	10.2
Salisbury (V)	1,672	1,742	70	4.2
South Esk (P)	1,924	1,957	33	1.7
Weldford (P)	1,601	1,591	-10	-0.6
TOTAL	31,084	31,852	768	2.4

P = Parish
V = Village
* Includes Huskisson Parish

SOURCE: Statistics Canada, 1981, 1986

TABLE B-10: NEWCASTLE TO BATHURST, POPULATION, 1981, 1986

	1981	**1986**	**Change**	**% Change**
Allardville (P)	3,076	2,998	-78	-2.5
Bathurst (C)	15,705	14,683	-1,022	-6.5
Bathurst (P)	4,870	5,475	605	12.4
Douglastown (V)	1,091	1,133	42	3.9
Newcastle (P)	2,929	3,113	184	6.3
Newcastle (T)	6,284	5,804	-480	-7.6
TOTAL	33,955	33,206	-749	-2.2

C = City
P = Parish
T = Town
V = Village

SOURCE: Statistics Canada, 1981, 1986

TABLE B-11: BATHURST TO BELLEDUNE, POPULATION, 1981, 1986

	1981	1986	Change	% Change
Belledune (V)	678	579	-99	-14.6
Beresford (P)	5,771	6,101	330	5.7
Beresford (T)	3,652	3,851	199	5.4
Durham (P)	2,559	2,461	-98	-3.8
Nigadoo (V)	1,075	974	-101	-9.4
Petit-Rocher (V)	1,873	1,924	51	2.7
Point-Verte (V)	1,335	1,257	-78	-5.8
TOTAL	16,943	17,147	204	1.2

P = Parish
T = Town
V = Village

SOURCE: Statistics Canada, 1981, 1986

the 1986 Census. The proportion of people living in the incorporated municipalities has decreased since the 1981 Census but by less than one percent.

B.2.1.4 Employment and Income

Salisbury to Newcastle

An overview of the employment characteristics for the Salisbury to Newcastle region is provided in Table B-12. The size of the labour force in this region has increased for both females and males over the 1981 to 1986 period; the female labour force increased by 28.3 percent from 3,805 in 1981 to 5,305 in 1986; the male labour force increase for this period increased by 12.0 percent from 7,650 in 1981 to 8,690 in 1986. Although the number of males employed increased by 6.9 percent from 6,130 to 6,585 and the number of females employed increased by 21.6 percent from 3,025 to 3,860 during this period, the overall unemployment rate for both males and female increased because the labour force grew at a faster rate than employment opportunities.

Only four of the 17 Parishes and Villages in the region had a lower unemployment rate than the 18.8 percent unemployment rate for the Northeast Region of the Province in 1986 (New Brunswick Statistics Agency 1990).

Newcastle to Bathurst

An overview of the employment statistics for the Newcastle to Bathurst region is shown in Table B-13. The male labour force decreased by 4.1 percent while the female labour force increased by 8.2 percent during the 1981 to 1986 Census period. The increase in the female labour force may be a result of the increased high unemployment in the male work force. The number of persons employed encountered a similar trend, with the number of males employed decreasing by 10.9 percent and the number of females employed increasing by 7.1 percent in the same period. However, the number of unemployed in the region has also increased for both females and males as the growth of the labour force has exceeded the growth of the economy and thus the growth of employment opportunities.

The Parish of Allardville was the only area to have a higher unemployment rate than the 1986 rate of 18.8 percent for the Northeast Region of the Province (New Brunswick Statistics Agency 1990).

TABLE B-12: SALISBURY TO NEWCASTLE, EMPLOYMENT, 1981, 1986

	1981		1986		% Change	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**
Labour Force	7,650	3,805	8,690	5,305	12.0	28.3
Employed	6,130	3,025	6,585	3,860	6.9	21.6
Unemployed	1,475	720	2,115	1,430	30.3	49.7

SOURCE: Statistics of Canada, Census of Canada, 1981, 1986

TABLE B-13: NEWCASTLE TO BATHURST, EMPLOYMENT, 1981, 1986

	1981		1986		% Change	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**
Labour Force	8,745	5,550	8,385	6,045	- 4.1	8.2
Employed	7,740	4,650	6,900	5,005	-10.9	7.1
Unemployed	1,005	895	1,480	1,035	32.1	13.5

SOURCE: Statistics of Canada, Census of Canada, 1981, 1986

Bathurst to Belledune

An overview of the employment statistics for the Bathurst to Belledune region are shown in Table B-14. The labour force for males and females has increased by 6.0 percent and 14.0 percent respectively. The larger increase in the female labour force may be a result of an increase in the number of single-parent households and a current trend towards women working outside the home. The number of employed persons experienced a similar increase, with the female portion of the labour force experiencing the higher percentage increase of 14 percent as compared to a 4.2 percent growth for the male portion of the labour force. However, for the 1986 Census period, the number of females and males employed expressed as a percent of the labour force was 77.0 and 77.9 percent for females and males respectively. In absolute terms, more men are employed than women because more men than women are in the labour force. While the numbers in the labour force have been increasing, all are not successfully employed and the number of unemployed has also risen, 11.0 percent for males and 14.1 percent for females.

The Town of Beresford and the Village of Pointe-Verte are the only two areas which had a lower unemployment rate than the 1986 Northeast Region unemployment rate (New Brunswick Statistics Agency 1990).

B.2.1.5 Industrial Structure and Economic Base

Employment and Immigration Canada (EIC) has divided the Province into regions. The study corridor which stretches from Salisbury in the south to Belledune in the north, most closely corresponds to EIC's Northeastern Region. The Northeastern Region includes the counties of Kent, Northumberland and Gloucester. In 1989, this Region had an unemployment rate of 19 percent, compared to 10.6 percent for the Province (P. Richard, pers. comm.).

Salisbury To Newcastle

The largest employment sector in the Salisbury to Newcastle region is the service sector, accounting for 26.2 percent of the employment as shown in Table B-15. The pulp and paper industry is the most important industry in the part of the study corridor closest to the Miramichi Region (Northumberland County). The Miramichi Region is under the jurisdiction of the Miramichi Region Development Corporation. The largest employer in this region is Miramichi Pulp and Paper (Repap); this company is currently undertaking an expansion to its operation in Newcastle worth approximately one billion dollars.

TABLE B-14: BATHURST TO BELLEDUNE, EMPLOYMENT, 1981, 1986

	1981		1986		% Change	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**
Labour Force	4,300	2,395	4,575	2,785	6.0	14.0
Employed	3,415	1,845	3,565	2,145	4.2	14.0
Unemployed	890	550	1,000	640	11.0	14.1

SOURCE: Statistics of Canada, Census of Canada, 1981, 1986

TABLE B-15: SALISBURY TO NEWCASTLE, EMPLOYMENT BY SECTOR, 1986

	Primary	Manu-facturing	Construction	Trans-portation	Trade	Finance	Government	Other
Acadieville (P)	70	25	75	40	35	15	20	85
Chatham (P)	50	205	110	100	325	35	525	370
Coverdale (P)	60	145	195	235	350	60	110	410
Derby (P)	10	105	65	65	50	15	35	95
Glenelg (P)	100	35	80	65	85	5	190	190
Harcourt* (P)	35	20	25	55	25	0	5	30
Nelson (P)	50	95	35	25	70	15	30	60
Nelson-Miramichi (V)	30	160	45	55	95	20	35	200
North Esk (P)	85	205	185	70	185	10	65	295
Rogersville (P)	125	65	65	20	75	15	25	135
Rogersville (V)	85	60	40	40	60	30	15	180
St. Louis (P)	185	60	155	20	95	25	35	330
St. Paul (P)	70	95	50	40	65	20	10	105
Salisbury (P)	245	220	55	155	290	15	70	430
Salisbury (V)	20	70	75	100	155	55	60	220
South Esk (P)	150	120	80	40	90	10	25	215
Weldford (P)	190	100	95	50	70	–	25	90
TOTAL	1560	1784	1430	1175	2120	345	1280	3440
PERCENT	11.9	13.6	10.9	9.0	16.1	2.6	9.7	26.2

P = Parish
V = Village
* Includes Huskisson Parish

SOURCE: Statistics Canada, Census of Canada, 1986

Kent County is under the jurisdiction of the Kent County Industrial Commission. Commercial fishing and fish processing is the most important industry in the Kent County portion of the study corridor, accounting for 39 percent of the manufacturing sector (including fish processing) (W. Ferguson, pers. comm.).

Forestry is the second major primary (natural) resource in Kent County with forests constituting 80 percent of the surface area of the region. The industry supplies two pulp and paper mills in Newcastle and two in Saint John, with approximately 70,000 cords per year sold at a value of four million dollars. The wood-processing industries (primarily sawmills) are spread throughout the Kent County area, and several other firms in the County manufacture wood products such as wooden boxes, pallets and furniture parts. Two Christmas tree cooperatives are located within the County, one of which had sold 40,000 trees by 1988; the industry is becoming an imposing economic source. Agriculture is the third primary resource industry in Kent County, with cruciferous vegetables becoming more popular and profitable. Major crops include brussels sprouts, broccoli, cauliflower, and blueberries. Although coal is present in the Lakestream and Beersville areas, this resource remains basically unexploited due to a lack of demand for the coal (Kent Industrial Commission Inc. 1988).

Tourism is another major industry in Kent County, accounting for 11 percent of the employment (W. Ferguson, pers. comm.). The natural wilderness resources of this area make it an important tourist destination within New Brunswick. Several tourist facilities have been developed in the region, which offers a variety of winter and summer activities, and many communities have popular festivals and carnivals (Kent Industrial Commission Inc. 1988).

A major investment in the Kent County portion of this section has been the rebuilding of a new mill for Delco Forest Products; the original pulp mill burnt down two years ago (W. Ferguson, pers. comm.). Employment related to the defence industry has decreased since 1986, with major cutbacks at CFB Chatham and the closing of CFS St. Margarets.

Newcastle To Bathurst

The industrial structure of the Newcastle to Bathurst region is primarily based on the service sector, accounting for 33.8 percent of the employment and the trade sector, accounting for 19.8 percent of the employment; the employment by sector in this region is shown in Table B-16. Gloucester County in the northern portion of this region relies heavily on mining (Brunswick Mining and Smelting) while Northumberland County in the southern portion of this region relies on the pulp and paper industry (Miramichi Pulp and Paper (Repap)) as its primary

TABLE B-16: NEWCASTLE TO BATHURST, EMPLOYMENT BY SECTOR, 1986

	Primary	Manu-facturing	Construction	Trans-portation	Trade	Finance	Government	Other
Allardville (P)	215	105	95	40	140	20	35	220
Bathurst (C)	680	670	160	300	1455	225	630	2,395
Bathurst (P)	405	280	155	170	450	40	195	630
Douglastown (V)	15	55	35	35	85	10	45	130
Newcastle (P)	115	130	130	95	200	35	140	485
Newcastle (T)	115	345	160	190	450	105	340	890
TOTAL	1,545	1,585	735	830	2,780	435	1,385	4,750
PERCENT	11.0	11.3	5.2	5.9	19.8	3.0	9.9	33.8

C = City
P = Parish
T = Town
V = Village

SOURCE: Statistics Canada, Census of Canada, 1986

employer. The number of people employed in the primary and manufacturing sectors has increased by 85.7 percent in the region since 1982 (Applied Management Consultants 1988). The Miramichi Region's economy is 70 percent wood-based (it has the most diversified wood industries in Atlantic Canada), with mining, agriculture, fishing, peat moss and tourism rounding out the regions' resources. The Miramichi port is open year round and is the second largest port in New Brunswick, and the fourth largest in the Atlantic Region (Miramichi Regional Development Corporation 1983).

Forestry is the main primary (natural) economic resource, with approximately 2,500 woodlot owners with over 350,000 stocked acres of forest land in the region. In 1983 there were 16 wood products manufactured in the region, and 15 mill operations (large and small), with six located within the study corridor. Mining is the second major primary economic resource. In 1983, Heath Steele located at Little River was the major mining operation, operating a lead-zinc-copper mine and a concentrator. Several mining explorations were conducted in the Region in the mid-to-late 1970s. There are two large peat bogs (Eel River, New Brunswick's largest, and Escuminac, about one-third smaller) east from Chatham, lying one-third within Northumberland County and two-thirds in Kent County (Miramichi Regional Development Corporation 1983).

The main fishery is based on sport-fishing of Atlantic salmon, and the Miramichi River system is world-famous for this sport. Commercial catches in Miramichi Bay and the mouth of the River consist principally of lobster, clams, oysters, herring, mackerel, and gaspereau, and some cod (Miramichi Regional Development Corporation 1983).

Within the Province as a whole, tourism ranks third in economic importance, behind forestry and mining. Within the Miramichi Region, there are annual summer festivals in various municipalities, most notably the Miramichi Folk Song Festival (Newcastle), and the Miramichi Agricultural Exhibition (Chatham). In addition, the Miramichi Region offers visitors a wide variety of outdoors activities.

The Economic Development Officer of the Miramichi Regional Development Corporation has indicated that three major economic developments are planned for the area, with an estimated $18.4 million being invested in the three projects (C. Mutch, pers. comm.). Other recent major investments in the Region, either completed or ongoing, totalled $599.2 million (and does not include the Douglas River Plaza in Douglastown, which has been completed and leased) (C. Mutch, pers. comm.).

For Gloucester County, the Chaleur Regional Hospital and Government are major employers within the Chaleur Region Industrial Commission's boundaries (P. Pitre, pers. comm.). A major investment in the northern portion of this section is the revitalization of the Moncton airport; Air Nova now uses this airport and has provided a great boost to the local economy (P. Pitre, pers. comm.).

Bathurst To Belledune

The industrial structure of the Bathurst to Belledune region is primarily based on the service sector, accounting for 29.7 percent of the employment and the manufacturing sector, accounting for 16.6 percent of the employment; employment by sector in this region is shown in Table B-17. This region relies heavily on mining (Brunswick Mining and Smelting) (P. Pitre, pers. comm.), which is the most important resource base in the Chaleur Region (Chaleur Regional Development Commission Inc. 1989). There are in excess of 30 known base metal deposits in the Bathurst area, with the area containing approximately 39 percent of Canada's known zinc deposits, 45 percent of the country's lead and 38 percent of its silver. As the value of mineral production in New Brunswick has increased from $16,275,991 in 1952 to $702,000,000 in 1986, and considering that the bulk of New Brunswick's mining activity since 1952 has been based in the Bathurst area, this phenomenal growth points to a bright future for the Chaleur Region (Chaleur Regional Development Commission Inc. 1989).

A major investment in this area has been NB Power's proposed power plant at Belledune, which will provide a great boost to the local economy (P. Pitre, pers. comm.). Fisheries, an historically important economic activity in the Chaleur Region, declined drastically by the 1980s with the advent of the mining industry (Chaleur Regional Development Commission Inc. 1989). However, the establishment of two large, modern fish-processing plants at Petit-Rocher and Stone Haven has revived the industry to some extent, employing up to 450 area residents on a seasonal basis. The forest industry in the Chaleur Region supplies a growing pulp and paper industry. It remains a valuable asset and could be developed as a base for a small secondary wood products industry (Chaleur Regional Development Commission Inc. 1989).

B.2.1.6 Transportation Networks

Roads

Within the study corridor, the major transportation networks are situated in the Moncton to Sussex area, the Newcastle-Chatham to Blackville area, and the Bathurst to Campbellton area.

TABLE B-17: BATHURST TO BELLEDUNE, EMPLOYMENT BY SECTOR, 1986

	Primary	Manu-facturing	Construction	Trans-portation	Trade	Finance	Government	Other
Belledune (V)	20	100	5	–	15	10	5	45
Beresford (P)	330	315	230	110	360	55	150	710
Beresford (T)	235	155	135	75	305	60	165	590
Durham (P)	145	195	65	45	80	–	15	125
Nigadoo (V)	45	70	55	25	145	10	45	125
Petit-Rocher (V)	60	135	75	15	85	50	90	295
Point-Verte (V)	100	115	35	35	40	10	35	120
TOTAL	965	1,175	615	330	1,090	235	525	2,085
PERCENT	13.8	16.7	8.8	4.7	15.5	3.4	7.5	29.7

P = Parish
T = Town
V = Village

SOURCE: Statistics Canada, Census of Canada, 1986

The New Brunswick highway system is divided into several designated highway types, as follows:

- Trans Canada Highway;
- principal highways;
- collector highways;
- local highways; and
- local roads.

The highway corridor which connects Sussex and Moncton and which passes north of Salisbury is the Trans Canada Highway (Route 2). Route 15 at Moncton is the only principal highway within this region. Several east-west oriented collector and local highways serve the intervening areas between Moncton and the area around Salisbury. These include Route 112 (the Fredericton Road) and Route 106 (collector highway), and Routes 880 and 885 (local highways). Local roads are numerous.

There is one north-south collector highway, Route 126, which connects Moncton and Newcastle; the proposed route generally follows to the west of this highway. Route 126 is crossed by one collector highway, Route 116 (the Salmon River Road). From the south to the north there are five local highways (Routes 485, 515, 465, 480 and 440) which connect Route 126 and points to the east. There are numerous local roads east of Route 126, but very few to the west of this highway.

The Newcastle-Chatham region is served by Route 8, a principal highway which connects the area to Fredericton to the southwest and Bathurst to the north. It is also connected to the Acadian Peninsula to the northeast and coastal communities to the southeast by Route 11. Collector highways are Route 126 from Moncton, and Routes 108 and 118 to the southwest, bordering the Southwest Miramichi River. Local Routes 420 and 425 border the Northwest Miramichi River; Route 430 serves areas to the northwest. There are numerous local roads. The proposed Newcastle-Douglastown By-pass is to be located in the vicinity of Route 430 (M. Phillips, pers. comm.).

Route 8, a principal highway, is the only highway connection between Bathurst and Newcastle. Collector Routes 134 and 160 form a junction at Allardville, as does local Route 360. Route 11 bypasses Bathurst and generally follows the coast of Chaleur Bay on its way to Campbellton.

The coastal Route 134 is a collector highway. Route 180, a collector highway, connects Bathurst with the interior of the Province to the west.

Numerous local roads and two local Routes (315 and 322) serve communities between Bathurst and Belledune.

Railroads

The Canadian National Railways transportation network radiates from Moncton in four directions:

- east to Nova Scotia with a spur to Shediac;
- southwest to Saint John along the Trans Canada Highway;
- west to Chipman, Minto and Fredericton; and
- north to Newcastle along the west side of Route 126.

From Newcastle, CNR lines radiate southwest to Fredericton along Route 8, east to Chatham and Loggieville, and north to Bathurst. The latter line forms a corridor with the existing transmission line and the proposed route for the proposed 345 kV transmission line.
From Bathurst, CNR lines radiate east along the north shore of the Acadian Peninsula, and north and west along the north shore of Chaleur Bay to Campbellton and Quebec. A private line owned by Bathurst Power and Paper connects Bathurst and Brunswick Mines to the southwest.

B.2.1.7 Existing Transmission Lines

NB Power transmission lines are assigned four-digit numbers which correspond to their capacity (NB Power, pers. comm.):

- 69 kV lines begin with 0;

- 138 kV lines begin with 1;
- 230 kV lines begin with 2; and
- 345 kV lines begin with 3.

The transmission lines discussed below are shown on Maps 1 to 8. Salisbury and Moncton form a hub for a series of transmission line networks which serve the rest of New Brunswick, and also connect to Nova Scotia. Salisbury and Moncton are connected by two lines, 1148 and 1151 (a double line corridor). There are a series of low capacity lines serving the area east of Salisbury, including line 0003. Line 3006 connects Salisbury to Nova Scotia via Memramcook. A three-line corridor connects Salisbury to Norton (lines 0003, 1149 and 3004) and ultimately Coleson Cove. Line 2145 follows this corridor a short distance to the southwest but then travels westward to Keswick Ridge. Further north, lines 0006 and 1101 form a double-line corridor which connects Moncton and Grand Lake.

At present line 0010 is the only direct connection between Moncton and the Chatham area. This line is situated on the east side of Route 126. Line 3017 is the proposed 345 kV connection between Salisbury and Newcastle. At Newcastle, a complex of lines connect to the southeast (1118), the southwest (1105 and 2131), the north (2131, due north within the railway and transmission line corridor and 1106, along Route 8), and the northwest (0032, with spur line 0116)). Other lines in the Chatham area are 0007 and 0009. Line 3019 is the 345 kV proposed route between Newcastle and Bathurst; it will parallel line 2131 between Newcastle and Bathurst.

There is a major transmission line corridor between the Bathurst and Eel River terminals consisting of lines 0025, 1115, 2150 and 3008 within a four-line corridor. Although line 3008 is only energized to 230 kV, it has been constructed to 345 kV specifications. Lines also connect the Bathurst terminal with the northeast shore communities (0063), Caraquet (1152), Bathurst Mines (0031, a private line), and Brunswick Mines and west (0062 and 1137). Line 1128 connects the Belledune industrial area to the main corridor.

B.2.1.8 Watersheds

The study corridor crosses two Municipal Water Supply Watersheds:

- Nigadoo River, which supplies Petit-Rocher; and

- Middle River and Carter's Brook, which supplies Bathurst.

The Village of Petit-Rocher draws its water from the 156 km^2 Nigadoo River watershed, which is the only proven source of municipal water in the Belledune Region. Many communities in the region may have to rely on this source in the future (Underwood McLellan Ltd. 1985). The City of Bathurst and the Town of Beresford receive their water from the Middle River watershed which, with an area of 220 km^2, is the fourth largest watershed in the Province (Underwood McLellan Ltd. 1985).

B.2.2 Study Corridor Overview

B.2.2.1 Recreational Land Use

A review of existing literature and discussions with DTRH, DNRE, and University of New Brunswick and University of Moncton staff indicate a lack of relevant data on recreational activities in the study corridor or in the Province as a whole. Consequently, surveys of various organizations affiliated with recreational activities, with an emphasis placed on outdoor recreational activities, in New Brunswick was conducted. The organizations selected were thought to have local information on the level of recreational activity in the local area. The initial sample was drawn from **Recreation Info Loisirs** (DTRH 1989) which lists recreational agencies and groups throughout the Province and from the study team's past experience with the local areas.

The following groups were surveyed:

- Department of Tourism, Recreation and Heritage local offices staff located in Moncton, Newcastle and Bathurst;

- Department of Natural Resources and Energy Regional offices staff located in Moncton, Newcastle and Bathurst (Regions 3, 2 and 1, respectively) and other DNRE local offices within the study corridor as required;

- Municipal Recreational Councils for communities within or in close proximity to the study corridor; and

- recreational organizations, at the local and Provincial level, who could potentially use the study corridor.

The survey consisted of telephone interviews with different groups, organizations and agencies. The questionnaire, list of interviewees as well as sections of the proposed area used by these organizations, is provided in Appendix D. The goal of the survey was to obtain a general appreciation for the level and types of outdoor recreational activity that occurs within the study corridor, and the time, frequency and location of these activities within the study corridor. It was recognized that the intensity and frequency of recreational activity could not be quantified without conducting a survey of all residents and recreational clubs who could potentially use the area.

Recreational activities along the study corridor as outlined by regional recreational directors (R. Pelletier; R. Savoie; pers. comm.), include all types of indoor sports activities such as gymnastics, swimming, archery, badminton, basketball and ball hockey. Outdoor activities include hunting, fishing, canoeing, soccer, cycling, equestrian activities (Chatham Head and Millerton), golf (Newcastle), hiking and orienteering. Baseball and hockey are very popular sports and are participated in almost all of the communities within the study corridor. Softball is probably the most popular sport, as every small community has their team or league comprising of men, women and mixed leagues. All terrain vehicles (ATVs) are also very popular in all areas of the study corridor (R. Pelletier; R. Savoie; I. Fowler; pers. comm.)

Throughout the study corridor, hunting and fishing are popular recreational activities especially in those areas of the study corridor which are forested (I. Fowler; E. Bourque; G. Bryar; R. Savoie; T. Pettigrew; B. Dubé; A. Madden, pers. comm.).

Winter sports include figure skating, hockey, snowmobiling and cross-country skiing. Snowmobiling clubs have trails which link parts of the Province. Cross-country skiing is also very popular, with several very large clubs in the area ranging from 1,500 members in the Bathurst Club, 400 members in the Newcastle Club and approximately 200 members in the Rogersville Club. Trails are usually near a lodge or camp in loops of five to six kilometres. Other clubs include rifle and hand gun clubs, as well as an orienteering club which are located in Rogersville (R. Pelletier; R. Savoie; pers. comm.).

Watersports conducted on the Miramichi include sailing, which is very popular, and waterskiing. A marina is located in Douglastown. Along the north shore, swimming, wind surfing, motorboating are popular activities with some canoeing, kayaking and sailing (R. Pelletier; R. Savoie; S. Carter-Rose; pers. comm.).

Summer festivals also are host to a number of recreational activities, they are common in most larger communities (R. Pelletier, pers. comm.).

Wildfood harvesting is also very popular throughout the study corridor. Many residents participate in berry picking, especially for blueberries, in burned areas or recently cut areas. Wild strawberries and raspberries are also popular and are harvested where available. Fiddleheads are being picked but this is less popular than other types of wildfood harvested (R. Pelletier; R. Savoie; I. Agnew, pers. comm.).

Recreational uses were similar for all areas surveyed. The most popular outdoor activities being softball/baseball, hunting, fishing, canoeing, cross-country skiing and snowmobiling, although other activities, including wildfood harvesting and small game trapping for recreational purposes were fairly common (G. Roach; E. Bourque; S. Allen; I. Agnew; D. Malley; D. McAllister; A. Caissie; S. Carter-Rose, pers. comm.).

Sport Fishing

Recreational sport fishing information was obtained from DNRE offices located in Harcourt, Newcastle, Rogersville, Bathurst, Nash Creek, Campbellton, Hampton, St.-Louis, Petitcodiac, and Allardville. These offices issue fishing licences and police fishing activities within the study corridor. Fishing activities are also monitored by the Department of Fisheries and Oceans (DFO) staff from offices in Richibucto, Newcastle, Chatham and Bathurst.

There are seven drainage systems within the study corridor, with a total of three major and numerous minor rivers flowing through the corridor. DNRE personnel were contacted and surveyed with regard to the fishing capabilities of these rivers, with responses detailing activities on the more popular and populated sport fishing rivers. Table B-18 provides a listing of drainages and rivers within the study corridor.

The Tabusintac River is a scheduled river with fly fishing only from April 15 to May 15 and from July 1 to October 26 (annually) (A. Madden, pers. comm.). The Bartibog River is also a scheduled river with fly fishing only from September 15 to October 15 (B. Dubé, pers. comm.). The Tabusintac, Nepisiguit Rivers and Bartibog Rivers become designated waters (whereby a Guide is required for non-residents) after April 15 of each year (A. Madden; B. Dubé; pers. comm). All other rivers are neither designated nor scheduled (B. Dubé; A. Goguen; A. Madden; T. Pettigrew; pers. comm.). On all waters within the study corridor from Salisbury to Belledune, there are no Crown Reserve Waters and no angling leases (T. Pettigrew; G. Godin;

TABLE B-18: DRAINAGES AND RIVERS WITHIN STUDY CORRIDOR

- Petitcodiac Drainage
  - Petitcodiac River
  - North River
- Saint John Drainage
  - Canaan River
  - Salmon River
- Northumberland Strait Drainage
  - Richiboucto River
  - Coal Branch River
  - Kouchiboucasis River
  - Kouchibouguac River
- Miramichi Drainage
  - Southwest Miramichi River
  - Barnaby River
  - Right Hand Branch Barnaby River
  - Middle Branch Barnaby River
  - Northwest Miramichi River
  - Northwest Millstream River
  - East Branch Portage River
  - Bartibog River
  - Little Bartibog River
  - Campbell River
- Gulf of St. Lawrence Drainage
  - Tabusintac River
  - Eskedelloc River
- Nepisiguit Drainage
  - Nepisiguit River
  - Pabineau River
  - Middle River
  - Tetagouche River
- Chaleur Bay Drainage
  - Millstream River
  - Nigadoo River
  - North Branch Nigadoo River
  - South Branch Nigadoo River
  - Elm Tree River
  - Belledune River

SOURCE: 1:50,000 NTS Maps

R. Currie; A. Goguen; A. Goddard; J. Mundle; B. Dubé; P. Tatlock; A. Madden; J. Furlotte, pers. comm.).

Brook trout angling occurs along most major rivers within the Salisbury to Newcastle region. Most rivers in the region experience light to moderate levels of use for trout angling (T. Pettigrew; R. Babin; A. Goguen; J. Mundle, pers. comm.), with the level of use increasing to heavy as the corridor approaches the Miramichi River drainage system (B. Dubé, pers. comm.). Most angling occurs in the spring, primarily in the headwaters of the major rivers (T. Pettigrew, pers. comm.). There are no established Atlantic salmon runs in any of the rivers in the Petitcodiac River drainage system, and only one (Kouchibouguac River) in the Northumberland Strait drainage system. Due to the lack of salmon angling, none of the rivers in this region are either designated as requiring a guide or scheduled for fly fishing only.

In the past, the Petitcodiac River supported a sea-run population of Atlantic salmon, and there is a salmon pool located just west of the Village limits, where the transmission line is proposed to cross the Petitcodiac River (A. Goddard, pers. comm.). Should a sea-run population become established, the Petitcodiac River could establish a fall fishery (A. Goddard, pers. comm.). This could become a reality in the near future as there is a very light salmon fishery at the mouth of the Petitcodiac River, and DFO with the assistance of DNRE has been conducting a salmon stocking/restoration program of the River for several years (T. Pettigrew; A. Goddard; pers. comm.). Most of the fishing on the Petitcodiac River drainage is conducted by local residents and residents from the Moncton/Dieppe/Riverview area, from mid-April to mid-July (A. Goddard, pers. comm.). The North River is angled for trout only, with a light to moderate level of use by residents from mid-April to mid-July (A. Goddard, pers. comm.).

The Nevers Brook, a tributary of the Canaan River (in the Saint John River drainage system) experiences a moderate level of trout angling, as does the Canaan River itself, with the South and East Branch of the Canaan River experiencing light trout angling, fished primarily by local residents from mid-April to mid-July (T. Pettigrew; A. Goddard, pers. comm.). The Richiboucto River drainage system experiences a moderate level of angling for brook trout. The only exception to this moderate level of angling is on the Hudson Brook, which experiences a significant level of angling for brook trout in the spring (J. Mundle, pers. comm.). The Coal Branch River is important (downstream) for sea-run trout and experiences moderate to significant trout angling in the spring to early summer. The Richibucto River also experiences a high level of angling activity heavily fished in the fall for striped bass (T. Pettigrew; J. Mundle, pers. comm.).

Fishing on the rivers noted above (Petiticodiac, North, Nevers, Caanan, East Branch Caanan, Hudson Brook, Richibucto, Coal Branch) represents less than one percent of the trout angling which could occur in the Province (T. Pettigrew, pers. comm.).

The Kouchiboucasis experiences moderate to significant trout angling from April to mid-July, primarily by residents (B. Dubé, pers. comm.). The headwaters of the Kouchibouguac River experiences moderate to significant trout angling from May to mid-July (B. Dubé, pers. comm.), while the mouth of the River has a very light level of Atlantic salmon fishing. The Barnaby River is extensively fished for trout at different areas (by local residents) in the early spring (A. Goguen, pers. comm.).

In the Newcastle to Bathurst region of the study corridor, Atlantic salmon, as well as brook trout, are extensively angled. The rivers within the study corridor for this region are shown in Table B-10. All rivers within the Miramichi River drainage system are good waters for sport-fishing (both Atlantic salmon and brook trout) (B. Dubé; A. Goguen, pers. comm.), and are primarily used by residents, although some rivers, such as the Bartibog River and Little Bartibog, which are extensively angled for salmon at the headwaters, are used by non-residents. (B. Dubé, pers. comm.). Almost all rivers within the Miramichi River drainage system are extensively fished. Within the study corridor, the Bartibog River, Little Bartibog River, Green Brook and Campbell River are all extensively fished for salmon (B. Dubé, pers. comm.). Exceptions include the East Branch Portage River, which experiences moderate trout fishing by local residents from spring to mid-July, and the Millstream which experiences moderate use for trout and moderate activity for salmon during the fall run (B. Dubé, pers. comm.). Portions of the Green Brook and Campbell River are also important habitat for well established sea-trout populations (B. Dubé, pers. comm.).

On the Miramichi River itself, another species which is angled is striped bass, which is fished from spring to the end of June (B. Dubé, pers. comm.). The early end to the bass fishery is due to the warming of the rivers (B. Dubé, pers. comm.).

Historically, the Miramichi River has been one of the major Atlantic salmon producing rivers in eastern Canada. The salmon stocks of this river have contributed to distant fisheries around the coast of Newfoundland and Labrador, and West Greenland, and to local commercial fisheries that have harvested substantial numbers of Miramichi Atlantic salmon from trap nets in the tidal portion of the river system and from drift nets in Miramichi Bay.

The Miramichi River system also supports a large angling fishery in its two main branches and extensive series of tributaries (Reddin 1984). Historically the Miramichi has had the highest Atlantic salmon angling catch of all Canadian rives, averaging about 30,000 fish during the period 1949 - 1963 (Kerswill 1971). In more recent years overfishing has reduced populations and resulted in the implementation of severe controls including the closure of commercial fisheries and limits on angling.

In the Bathurst to Belledune region of the study corridor, the main sport fish are sea-run trout and Atlantic salmon, with resident brook trout also being angled (G. Godin; J. Furlotte; P. Tatlock; A. Madden, pers. comm.). The rivers in this region are shown in Table B-18. While all rivers in this region are extensively angled, only the Nepisiguit River is designated as requiring a Guide and scheduled (from June 1 to end of October) for fly-fishing only, downstream from Grand Falls (J. Furlotte; A. Madden, pers. comm.). All other rivers are angled almost exclusively by residents. The Nepisiguit River is fished extensively for Atlantic salmon for the first 31 km above its mouth; above the 31st km, is fished strictly for trout (J. Furlotte, pers. comm.). The importance of the Nepisiguit River is emphasized by the presence of both the Nepisiguit Salmon Association and the Nepisiguit Trout Protection Association (the only trout association in New Brunswick) (A. Madden; J. Furlotte, pers. comm.).

The Nigadoo River supports a significant sea-trout fishery and a light salmon fishery in the fall (A. Madden, pers. comm.). The Tetagouche River experiences moderate resident brook-trout angling, while the Middle River has a moderate to heavy sea-run trout fishery and a heavy salmon fishery downstream (A. Madden, pers. comm.). Middle River, and its tributaries, is very important as a population stock of Atlantic salmon (A. Madden, pers. comm.). The Belledune River supports a moderate resident and sea-run trout fishery, with the brook trout being fished primarily by residents (A. Madden; P. Tatlock, pers. comm.). The Little River was historically a "great" salmon river, however at the present time, there is no angling of any type conducted on the Little River (J. Furlotte, pers. comm.).

All of the rivers in the Bathurst to Belledune region are extensively angled from mid-April or May to mid-October, with the majority of the angling done in the spring (A. Madden; J. Furlotte; P. Tatlock, pers. comm.). The major exceptions are the Nepisiguit River, with fly-fishing from June 1 to the end of October, and the Belledune River, which experiences limited fishing in the fall due to salmon poachers (A. Madden, pers. comm.).

Overall, trout is the preferred sport fish (58.7 percent of all anglers) and salmon the next most popular (22.0 percent of all anglers).

The economic value of sport fishing at the Provincial level was estimated by DFO in a survey questionnaire completed in 1986 which related to angling activity in 1985. Based on the response to this survey, DFO estimated that anglers in New Brunswick spent $24.8 million on activities directly associated with sport fishing. Additionally, anglers invested $56.9 million on major durables and property, of which $26.5 million was used for sport fishing. In total, $51.3 million was directly attributable to sport fishing in New Brunswick in 1985. However, estimates of the value of the sport fishery at a regional level were not possible with this survey (Department of Fisheries and Oceans 1988).

Hunting

Recreational hunting information was obtained from DNRE offices located in Harcourt, Newcastle, Bathurst, Nash Creek, Campbellton, Hampton, St.-Louis, Petitcodiac, and Allardville. These offices issue hunting licences, record harvested species and police hunting activities within the study corridor.

Deer harvest data for Parishes along the study corridor is shown in Table B-19. The decrease in numbers of deer harvested from 1987 to 1988 is largely due to changes in deer management strategies (DNRE 1989). These changes included the requirement for a 48-hour waiting period for hunters who purchase licenses before hunting in order to curtail people registering deer they did not personally kill, and a four dollar increase in the deer licence fee.

The moose harvest in New Brunswick is subject to a strictly regulated hunt and limited to a three-day season each year. A maximum of 6,000 licence applications are issued by means of an annual moose licence lottery. Moose harvest data for Parishes along the study corridor is provided in Table B-20. In 1988, 24 percent of moose harvested were in Northumberland County, eight percent in Gloucester County and seven percent in Kent County. Albert, Westmorland and Restigouche Counties are represented by one Parish each which is within the study corridor; these three Parishes combined represent less than one percent of the moose harvested in 1988.

In the past, harvest statistics have been gathered at the Parish level, however, DNRE have recently established 27 Wildlife Management Zones and are in the process of compiling data at that level. Provincially, all big game harvests increased in 1989, especially moose, with the increase due to better weather (T. Pettigrew, pers. comm.).

TABLE B-19: DEER HARVEST BY PARISH (1979 - 1988)

COUNTY (Deer Harvest by Parish)	YEAR									
	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Albert										
Coverdale	N/A	N/A	N/A	N/A	N/A	N/A	N/A	246	194	130
Westmorland										
Salisbury	N/A	N/A	N/A	N/A	N/A	N/A	N/A	564	477	437
Kent										
Acadieville	11	8	24	25	49	34	64	53	39	14
Harcourt	201	321	364	464	581	461	630	496	519	441
Huskisson	8	5	33	32	65	36	38	26	70	44
St. Louis	6	13	15	25	32	33	38	26	20	19
St. Paul	19	10	43	34	31	25	49	43	44	45
Weldford	18	10	83	64	109	108	154	122	125	122
Northumberland										
Chatham	12	8	17	7	11	11	9	5	10	5
Derby	4	6	12	12	22	12	12	8	11	2
Glenelg	31	50	31	72	96	85	117	64	68	43
Nelson	19	40	40	52	83	41	91	47	79	53
Newcastle	24	45	35	42	53	53	60	36	28	14
Rogersville	31	54	68	60	67	42	71	40	28	34
Gloucester										
Allardville	17	32	14	33	51	20	35	15	14	5
Bathurst	117	159	93	202	260	192	125	40	42	9
Beresford	55	72	66	87	168	79	125	61	50	14
Restigouche										
Durham	N/A	N/A	N/A	N/A	N/A	N/A	N/A	17	5	4
Total (Parishes)	573	833	938	1,211	1,678	1,232	1,618	1,909	1,823	1,435
Total (Provincial)	13,333	18,342	21,771	22,656	27,118	26,016	31,128	28,061	26,479	19,741

N/A = Not Available

SOURCE : Modified from New Brunswick Department of Natural Resource and Energy (1989) [G. Redmond, T. Pettigrew, G. Godin (pers. comm) - Salisbury, Coverdale & Durham Parishes only]

TABLE B-20: MOOSE HARVEST BY PARISH (1986-1988)

COUNTY	YEAR		
	1986	1987	1988
Albert			
Coverdale	3	1	2
Westmorland			
Salisbury	10	7	0
Kent			
Acadieville	12	10	11
Harcourt	53	57	32
Huskisson	7	6	2
St. Louis	4	4	2
Weldford	5	6	4
Northumberland			
Derby	1	1	1
Nelson	17	15	16
Newcastle	12	14	16
Rogersville	23	19	15
Gloucester			
Allardville	23	38	21
Bathurst	52	58	56
Beresford	14	8	9
Restigouche			
Durham	5	8	5
TOTAL	241	252	192

SOURCE: T. Pettigrew, R. Currie, G. Godin (pers. comm.)

The Salisbury to Newcastle region is heavily hunted, as it passes through the Canaan River Game Management Area (A. Goddard, pers. comm.). This Game Management Area is located in Wildlife Management Zone 18, which is closed to moose hunting (T. Pettigrew, pers. comm.). Areas within the corridor that are not within the Canaan River Game Management Area experience fair hunting pressure (T. Pettigrew, pers. comm.). Due to low numbers, the deer season in the Rogersville area is very minor (A. Goguen, pers. comm.), as is the moose season (R. Babin, pers. comm.). These areas are not as extensively hunted as the Miramichi and Salmon River systems (R. Babin; T. Pettigrew, pers. comm.).

The first portion of the Salisbury to Newcastle region (the parishes of Coverdale, Salisbury and Harcourt) have a high annual deer harvest with 130 to 441 deer harvested in 1988. The remainder of this region (the parishes of Acadieville, Huskisson, St.-Louis, Weldford, Rogersville, Glenelg, St.-Paul, Nelson, Derby and Chatham) have a much smaller annual deer harvest, ranging from two animals harvested in Derby Parish to 122 harvested in Weldford Parish in 1988 (Table B-19). The annual moose harvest in 1988 for the entire region ranged from zero to 32 animals harvested in the 17 Parishes/communities in this region (Table B-20).

The Newcastle to Bathurst region experiences fair to moderate hunting pressure, but not on the scale as experienced on the upper rivers and tributaries of the Miramichi River system (R. Currie, pers. comm.). This section of the study corridor (the parishes of Newcastle, Allardville and Bathurst) experiences a low annual deer harvest from five to 14 animals harvested in 1988 (Table B-19). The annual moose harvest in 1988 ranged from 16 to 56 animals harvested (Table B-20). In addition to deer and moose, there are a small number of Guides who hunt for bear, although most of the hunting in the area is done by residents (R. Currie, pers. comm). The Bartibog region is "good moose country" (B. Dubé, pers. comm.).

The Bathurst to Belledune region is not extensively hunted in comparison to the southern part of the study corridor and the rest of the Province (G. Godin, pers. comm.). A few moose are hunted, mainly by local hunters, but there are no substantial deer populations in this section (P. Tatlock, pers. comm.). This region experiences a low annual deer harvest, from four to 14 animals in each of the areas within the study corridor in 1988 (Table B-19). The annual moose harvest in 1988 for areas in this region ranged from five to nine moose harvested (Table B-20). Bear is also hunted in this section, especially out of the Nepisiguit Lodge (as is grouse) (G. Godin; J. Furlotte; P. Tatlock, pers. comm.).

Snowmobiling

Snowmobiling is quite popular and several large clubs are located within the study corridor from Salisbury to Belledune. These clubs use transmission line right-of-ways along with hunters and fishermen as well as ATV enthusiasts, since they provide easy access to wilderness roads and otherwise inaccessible areas. Their local trails, which are generally located next to a clubhouse or meeting area, generally follow other roads or fields, although transmission line rights-of-way are also used. (G. McGraw; C. Landry, E. Landry, pers. comm.). In addition, several persons attending public information sessions noted that snowmobiling along transmission line right-of-ways is popular among local residents. The extent of the use is dependent upon its proximity to communities/hamlets.

The portion of the study corridor from Acadieville Parish to Newcastle is also used for an annual snowmobile trek between Cocagne and Newcastle/Chatham. This pleasure trip has been organized every year for over ten years. Trails from the various local clubs along the route are used. In 1989, 400 participants made the trip; these participants are from New Brunswick, as well as from Quebec, Nova Scotia, Prince Edward Island and the New England States (C. Landry; E. Landry; G. Fournier, pers. comm.).

Cross-country Skiing

The survey of recreational groups, clubs, organizations and agencies indicated that one of the most popular winter sports throughout the study corridor is cross-country skiing.

Most clubs would not be affected by a transmission line and do not use the transmission line right-of-ways as the terrain is generally too rough. People who engage in this activity wish to enjoy the "wilderness" and the tranquillity afforded by wooded trails. Thus, a 50 m right-of-way for a transmission line is too open (R. Vienneau, pers. comm.).

Canoeing

This activity is fairly popular throughout the study corridor, wherever there is a river that has sufficient water flow to allow canoeing or kayaking in spring and summer. Popular rivers include the Miramichi, Salmon, Tetagouche, Caanan, and Middle Rivers, as well as the Nepisiguit River in the north. (G. Roach; R. Pelletier; R. Savoie; I. Fowler, pers. comm.).

Camping

There are eight campgrounds, three Provincial parks and one rest area located within the study corridor as shown in Table B-21. All but one of the campgrounds are located in the Bathurst to Belledune region.

Camping is a popular activity during the summer within the Bathurst to Belledune region. The occupancy rate for the entire area of the northern portion of the Province is approximately 50 percent on weekends. Tourists comprise the majority of users, and some local residents and a few organizations/clubs also use the facilities (E. Chapman, pers. comm.). During the week days, use of the facilities is less but not excessively so. This is because there are a number of visitors who stay for the entire summer.

Due to the short summer period, camping in the northern portion of the Province is restricted to the warmer summer months, from June to mid-August (E. Chapman, pers. comm.). This is because temperatures begin to become much cooler at night by the end of August and families with children have a new school year about to begin. As all the campgrounds within the northern portion of the study corridor are situated fairly close to the coast (Chaleur Bay), campgrounds are not used by hunters or fishermen in the shoulder season (E. Chapman, pers. comm.).

Provincial Parks

There is a Provincial Park in each of the three regions of the study corridor:

- Steeves Mountain (Salisbury to Newcastle);
- The Enclosure (Newcastle to Bathurst); and
- Tetagouche Falls (Bathurst to Belledune).

Steeves Mountain Provincial Park, 20 km west of Moncton, is open from approximately May 20 to September 5 (W. Burley, pers. comm.). During the summer, there is a 33 percent occupancy rate for the 50 sites, with 3,500 campers (90 percent of whom are from out-of-Province and, of this, 23 percent from the United States) using the facilities (W. Burley, pers. comm.). The facility experiences approximately 2,200 day users, mainly tourists, during the summer, and is

TABLE B-21: CAMPGROUNDS AND PROVINCIAL PARKS WITHIN STUDY CORRIDOR

Type	Location	Number of Sites	Owner/Operator	Occupancy Rates (%)
Campgrounds				
Chapman's Tent & Trailer Park	14 km east of Bathurst	100	E.E.Chapman	50%*
Harbour View Trailer Park	3.2 km north of Bathurst (20 Youghall Dr.)	40	Andrew Cunnison	50%*
Heritage Tent & Trailer Park	2790 Bridge St., Bathurst	60	---	50%*
Hodnett's Camping	28 km east of Bathurst	25	C.E. Hodnett	50%*
Scoodic "Too" Campground	Belledune	30	---	50%*
Camping Haché	C.P. 304 Nigadoo	68	Clement Haché	50%*
Camping Murraywood Park Inc.	C.P. 268 Petit-Rocher	125	Gilles Chamberland	50%*
Thebeau Campground	Rogersville	12	Guy & Medard Thebeau	50%*
Provincial Parks				
Steeves Mountain	20 km west of Moncton	50	DTRH/William Henry	33%**
The Enclosure	5 km west of Newcastle	94	DTRH	37%**
Tetagouche***	on Tetagouche River		DTRH	
Rest Area				
Greystone****	Intersection Rte 8 and Hwy #455		DOT	

*	on weekends during peak season
**	during peak season
***	day park only, no camping
****	picnic area only (with dry toilets)
DTRH =	New Brunswick Department of Tourism, Recreation & Heritage
DOT =	New Brunswick Department of Transportation

SOURCE: New Brunswick Department of Tourism, Recreation and Heritage (1990); T. Slynn (pers. comm); E. Chapman (pers. comm).

closed from September to May, with no use during the shoulder and winter season (W. Burley, pers. comm.).

The Enclosure Provincial Park, 5 km west of Newcastle, is open from approximately mid-June to the first weekend in September (W. Burley, pers. comm.). During the summer, there is a 37 percent occupancy rate for the 94 sites, with 6,000 campers (55 percent from within New Brunswick, 48 percent from out-of-Province) using the facilities (W. Burley, pers. comm.). The facility experiences approximately 10,000 day users, mainly local residents who use the grounds for picnics (no swimming) during the summer (W. Burley, pers. comm.). The Enclosure is ordinarily closed from September to June but in recent years local cross-country ski clubs use it during the winter; there is no other use during the shoulder season and/or winter (W. Burley, pers. comm.).

Tetagouche Falls Provincial Park, located at Tetagouche Falls on the Tetagouche River (approximately 10 km from the mouth), is a day use area only; there is no camping at this facility (W. Burley, pers. comm.). During the summer months, approximately 1,300 locals use the facility for picnics; it is closed during the shoulder season and winter months (W. Burley, pers. comm.).

Rest Areas

Greystone Rest Area, located at the intersection of Route 8 and Route 455, was transferred to the Department of Transportation from the Department of Tourism, Recreation and Heritage in 1986 (W. Burley, pers. comm.). It is a fairly large rest area, with two or three lanes off the main entrance. It is open to the public and the Department of Transportation maintains the rest area from mid-June to mid-September. There are seven or eight picnic tables, and two or three dry toilets. Although records of actual number of users are not maintained, DOT indicated that it seems to be extensively used as there are always a large number of cars in the rest area. It is quite busy for approximately two months in the summer, but use declines significantly around the first of September (T. Slynn, pers. comm.).

Campsite Leases

Private campsite leases within the study corridor consist primarily of Crown campsite leases but freehold properties used for camps are also present. Campsite leases are located near Salisbury, Rogersville, along the Miramichi River (including Newcastle, Douglastown & Nelson Miramichi) and along the coastline of the Northern portion of the corridor (including Bathurst, Beresford, Petit-Rocher, Pointe-Verte & Belledune). Some of the older leases on riverbanks include riparian rights (exclusive right to fish).

Crown Campsite Leases in the Study Corridor

Camp sites are scattered throughout the study corridor on Crown land. Within the Salisbury to Newcastle region, there are a total of 52 campsite leases, 36 (69 percent) of which are presently numbered and leased. There is a significant concentration on Route 116 west of Mortimer. These include four single campsites and five clusters of six camp sites. Of the 30 campsites available in these five clusters, 23 (76 percent) are presently leased.

Within the Newcastle to Bathurst region, there are a total of 33 campsite leases all of which are presently numbered and leased. A major cluster of 12 campsites occur around Pabineau Lake, southwest of Bathurst. All but two of these campsites or 83 percent of the available Crown campsite land is leased.

Within the Bathurst to Belledune region, there are a total of 28 campsite leases of which 22 (78 percent) are presently numbered and leased. Three major clusters account for 60.7 percent (17 campsites) of all campsite leases in this region. However, of these clusters, only one of the six sites available at the Sormany Road Campsite Group has a lessee, none of the Millstream River Campsite Group leases have a lessee, and all five of the St. Michael Settlement Campsites have lessees.

B.2.2.2 Commercial Land Use

Forestry

Productive forest land accounts for 85 percent of New Brunswick's land base and supports its largest industry. It has been widely reported that as a result of past forest management practices, the forest age class structure in New Brunswick is such that a deficit in future wood supply is evident (Reed 1978; Hall 1978; O'Neill 1979; Lortie 1983, Watson 1984.).

The Crown Lands and Forests Act was introduced in 1982 to provide a framework for the development of long term forest management strategies which could be implemented by those using and managing the resource. The **Act** also provides a means by which the activities of the industry could be monitored and assessed. To qualify for a Crown Timber Licence, a licensee is required to own or operate a wood processing facility in New Brunswick and enter into a Forest Management Agreement with the Crown.

In the **Act**, Crown land allocation is based on the concept of Crown timber being the supply which is residual to that provided by private woodland operations. Thus, the **Act** established a mechanism for a stable market for wood produced on privately owned forest land.

The corridor passes through three DNRE Forest Regions (Regions 1, 2 and 3) which have jurisdiction over six Crown Timber Licences. The six Timber Licences and licensees (Figure B-8), from south to north, are described below and in Table B-22.

No. 7 - Fundy Licence

The Fundy Licence is held by Rothesay Paper Ltd., and is 407,330 ha in area. The annual allocation of 572,968 m^3 is divided between Rothesay Paper and its 25 sublicensees. For the 1988-1992 five-year plan, 1,000 ha/year will be planted, and 900 ha/year will be spaced, for a total of 1,900 ha/year of silvicultural treatments (D. MacFarlane, pers. comm.).

No. 6 - Queens-Charlotte Licence

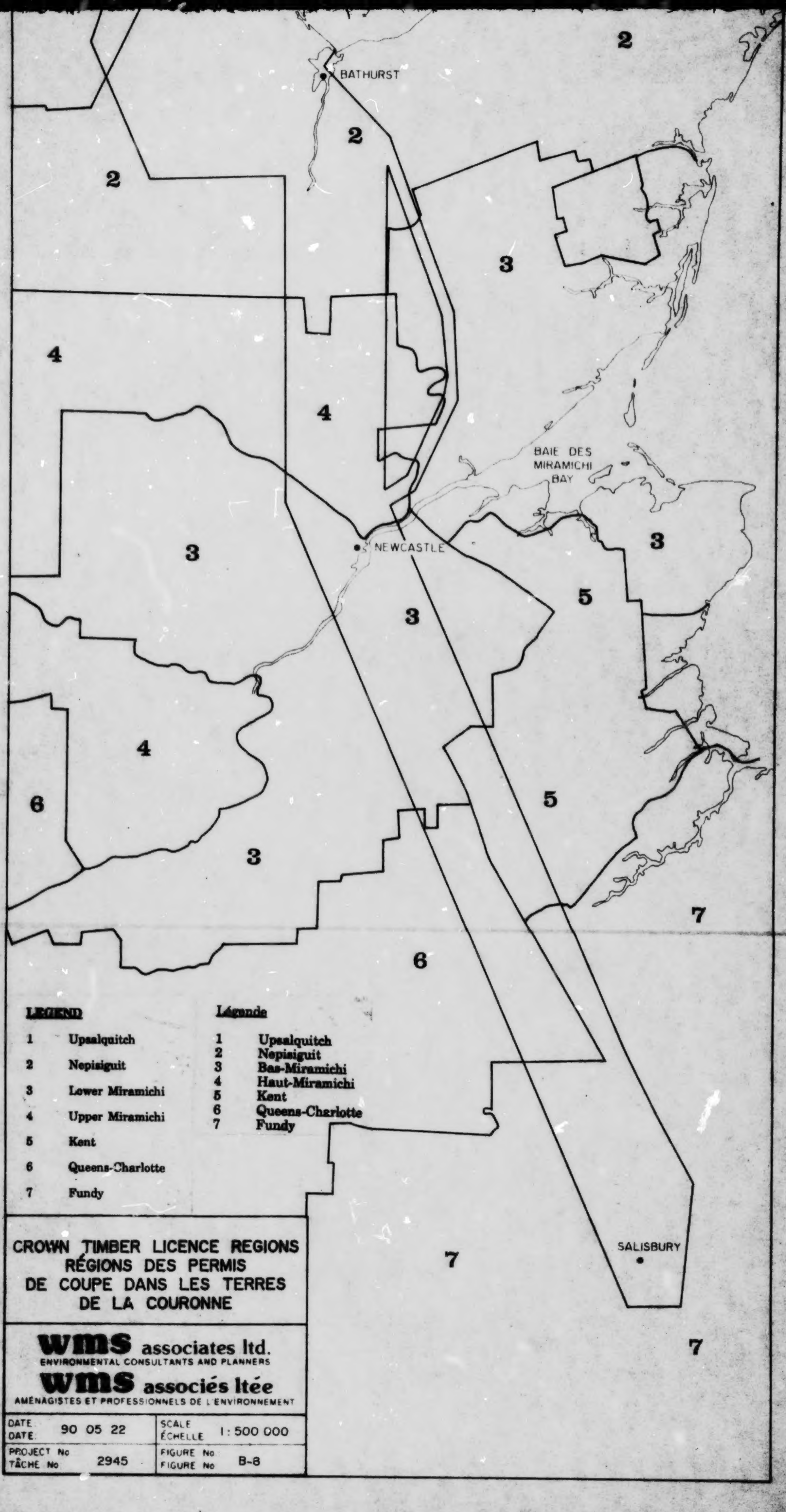
The Queens-Charlotte Licence is held by J.D. Irving Ltd., and is 407,330 ha in area. The annual allocation of 811,435 m^3 is divided between J.D. Irving Ltd. and its 32 sublicensees. For the 1988-1992 five-year plan, 1,900 ha/year will be planted, and 1,200 ha/year will be spaced, for a total of 3,100 ha/year of silvicultural treatments (D. MacFarlane, pers. comm.).

No. 4 - Upper Miramichi Licence

The Upper Miramichi Licence is held by Miramichi Pulp and Paper Inc., and is 403,875 ha in area. The annual allocation of 724,725 m^3 is divided between Miramichi Pulp and Paper and its 15 sublicensees. For the 1988-1992 five-year plan, 750 ha/year will be planted, and 2,500 ha/year will be spaced, for a total of 3,250 ha/year of silvicultural treatments (D. MacFarlane, pers. comm.).

No. 3 - Lower Miramichi Licence

The Lower Miramichi Licence is held by Miramichi Pulp and Paper Inc. and is 322,876 ha in area. The annual allocation of 477,275 m^3 is divided between Rothesay Paper and its


BATHURST
NEWCASTLE
BAIE DES MIRAMICHI BAY
SALISBURY
1
2
3
4
5
6
7

LEGEND		**Légende**
1	Upsalquitch	Upsalquitch
2	Nepisiguit	Nepisiguit
3	Lower Miramichi	Bas-Miramichi
4	Upper Miramichi	Haut-Miramichi
5	Kent	Kent
6	Queens-Charlotte	Queens-Charlotte
7	Fundy	Fundy

CROWN TIMBER LICENCE REGIONS
RÉGIONS DES PERMIS DE COUPE DANS LES TERRES DE LA COURONNE

wms associates ltd.
ENVIRONMENTAL CONSULTANTS AND PLANNERS
wms associés ltée
AMÉNAGISTES ET PROFESSIONNELS DE L'ENVIRONNEMENT

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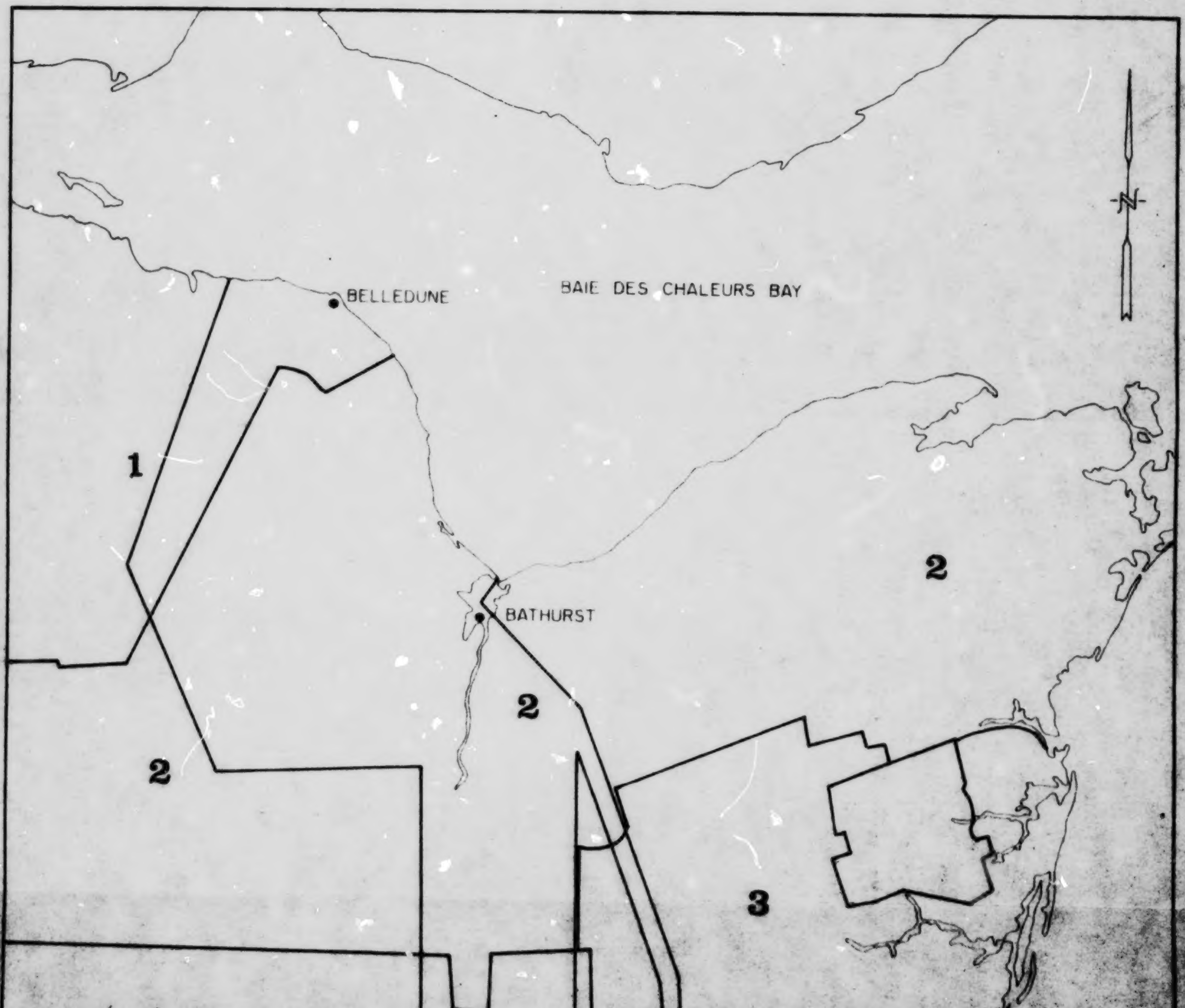


BELLEDUNE
BAIE DES CHALEURS BAY
N
1
BATHURST
2
2
2
3

TABLE B-22: CROWN TIMBER LICENCES, LICENSEES AND ANNUAL ALLOCATIONS

Licensee	Spruce, Fir Jack Pine (m^3)	Red & White Pine (m^3)	Cedar (m^3)	Hardwood (m^3)	Total (m^3)
Licence #7 Rothesay Paper	439,203	15,045	9,910	108,810	572,968
Licence #6 J.D. Irving	637,520	38,800	33,800	101,315	811,435
Licence #4 Miramichi Pulp & Paper	633,715	9,975	11,745	69,290	724,725
Licence #3 Miramichi Pulp & Paper	362,665	28,475	20,785	65,350	477,275
Licence #2 Stone Consolidated	357,590	1,305	11,945	94,130	464,970
Licence #1 NBIP Forest Products	496,140	14,895	16,285	91,300	618,620

SOURCE: Modified from New Brunswick Department of Natural Resources and Energy, unpublished data; and D. MacFarlane, pers. comm.

25 sublicensees. For the 1988-1992 five-year plan, 1,100 ha/year will be planted, and 400 ha/year will be spaced, for a total of 1,500 ha/year of silvicultural treatments (D. MacFarlane, pers. comm.).

No. 2 - Nepisiguit Licence

The Nepisiguit Licence is held by Stone-Consolidated Inc. and is 263,148 ha in area. The annual allocation of 464,970 m^3 is divided between Stone-Consolidated and its 17 sublicensees. For the 1988-1992 five-year plan, 900 ha/year will be planted, and 285 ha/year will be spaced, for a total of 1,185 ha/year of silvicultural treatments (D. MacFarlane, pers. comm.).

No. 1 - Upsalquitch Licence

The Upsalquitch Licence is held by NBIP Forest Products Inc., and is 380,249 ha in area. The annual allocation of 618,620 m^3 is divided between NBIP Forest Products Inc. and its 15 sublicensees. For the 1988-1992 five-year plan, 1,335 ha/year will be planted, and 300 ha/year will be spaced, for a total of 1,635 ha/year of silvicultural treatments (D. MacFarlane, pers. comm.).

Harvesting is generally carried out between May and the middle of March, or until the annual allocation is harvested. If the annual allowable cut has not been reached before snowfall, mechanical harvesting systems are able to continue operations. However, in the event of extreme snow conditions even mechanical harvesting operations can be prohibited (G. Watling, pers. comm.).

Agriculture

There are few areas of intensive agriculture within the study corridor. Information regarding the number of farms within the study corridor is provided in Table B-23. Most agricultural areas are situated in the Salisbury to Newcastle region, with a few scattered locations along Route 126, namely Rogersville and other communities. As noted in Section B.2.1.5, agriculture is the third primary resource industry in the Kent County Region, with cruciferous vegetables becoming more popular and profitable (Kent Industrial Commission Inc. 1988). Major crops include:

- brussels sprouts (160 ha, primarily in the Rogersville area);

TABLE B-23: NUMBER OF FARMS WITHIN STUDY CORRIDOR IN 1986

County	Number Of Farms	Number Of Of Livestock And Poultry	Gross Sales $
Albert	136	4,691	5,335
Westmorland	487	14,613	21,784
Kent	192	5,035	8,687
Northumberland	139	X	5,588
Gloucester	202	3,342	8,729
Restigouche	96	X	8,694
Provincial	3,554	94,544	222,681

X - Confidential Data

SOURCE: Statistics Canada, 1986 Census Data, New Brunswick

- broccoli (100 ha);
- cauliflowers (25 ha); and
- blueberries (approximately 365 ha).

Bogs, some of which are located within the study corridor as noted in Section B.2.2.2, may also be suitable for cultivation of carrots, parsnips and cranberries. However, these bogs have not yet been developed (J. Thibeault, pers. comm.).

A large surface area of land suitable for cultivation is not exploited but efforts are under way to stimulate greater agricultural exploitation (Kent Industrial Commission Inc. 1988). Specifically, these land areas include St. Louis de Kent/St. Charles and Rogersville. In the St. Louis de Kent area, a German delegation has expressed an interest in either buying or renting approximately 400 ha of land to cultivate seed potatoes. Presently, the group is conducting soil samples of the proposed land. In the Rogersville area, an agricultural cooperative has been reorganized to enhance the production of brussel sprouts and other diversified crops. This land area lies within the proposed transmission route.

Agricultural land within the Miramichi Region is well-suited to hay, grain and dairy farming, however, a shortage of modern and sufficient storage devices for vegetable and fresh fruit, and secondary support services for the region, preclude the development of this industry (Miramichi Regional Development Corporation 1983).

The other main areas of agriculture are located in the Bathurst to Belledune Region, specifically in the region west of Bathurst, from Tatamagouche north to Belledune. Less than two percent of commercial farming activity occurs in the Chaleur Region; dairy farming and potato production account for more than half of total farm cash income. However, due to the quality of soil and climatic conditions, other agricultural activities are limited (Chaleur Regional Development Commission Inc. 1989).

Information on crops and soil capability is obtained on a regional basis, rather than by individual County, by the New Brunswick Department of Agriculture. Within the study corridor, regions 1, 6, and 7 gives crop and soil information for Albert, Gloucester, Kent, Northumberland, and Westmorland Counties. The boundaries of these regions are illustrated on Figure B-9.

Region 1, the northeast, takes in Gloucester County. In the region there is a total of 51,895 cleared ha, 70.5 ha in horticulture crops (vegetables, strawberries, tobacco) and, 7,628 field crops (grains, potatoes, pasture, fodder). Agriculture in the region is animal or crop farming or a combination of both (New Brunswick Department of Agriculture, undated).

Region 6, the southeast, takes in Albert, Kent, and Westmorland Counties, but Westmorland County is by far the most important of the three in terms of agricultural commodities (A. Gaudet, pers. comm.). In the region there is a total of 79,526 cleared ha, 632.8 ha horticulture crops (vegetables and strawberries) and 36,068 ha in field crops (grains, potatoes, pasture, fodder). The dominant form of agriculture is cattle and dairy farming and the horticultural crop of tobacco and brussel sprouts (New Brunswick Department of Agriculture, undated). As noted previously, cruciferous crops such as brussel sprouts, cauliflowers, broccoli are becoming more popular and profitable in Kent County. In addition to this, blueberries and other vegetables are being cultivated. In terms of regional distribution in the Province, 12 percent of blueberry production and 21 percent vegetable production occurs in the southeast region (Statistics Canada, Census of Agriculture, 1986).

Region 7, the eastern, takes in Northumberland County. In the region there is a total of 21,167 cleared ha, 216.6 ha in horticultural crops (vegetables and forage) and 2,432 ha in field crops (grains, potatoes, pasture, fodder). The agriculture is mixed and confined to coastal areas and areas adjacent to major rivers (New Brunswick Department of Agriculture, undated). In Northumberland County, farming land is well suited for hay, grain, and dairy framing. The majority of agricultural land use is predominately beef farming (V. Taylor, pers. comm.).

To obtain a better understanding of the capability of the study corridor to sustain commercial agricultural activity a review of the soil capability for agriculture classes 1, 2, 3, and 4 have been mapped on the 1:250,000 scale as defined by the Canada Land Inventory. There is no Class 1 in the Province, and no Class 2 within the corridor. However, there are large areas of Class 3 and 4, including complexes of both. Class 3 soils have moderately severe limitations that restrict the range of crops and Class 4 soils have severe limitations that restrict the range of crops (The Canada Land Inventory, 1965). The percent of Class 3 and 4 land contained within the five counties in the study corridor is noted below:

- Albert County contains 33 percent;
- Gloucester County contains 69 percent;

- Kent County contains 70 percent;
- Northumberland County contains 42 percent; and
- Westmorland County contains 69 percent.

Trapping

Trapping information was obtained from the DNRE offices located in Rogersville, Harcourt, Petitcodiac, Newcastle, Bathurst, Nash Creek, St.-Louis and Allardville. These offices issue trapping licences, record harvested species and police trapping activities within the study corridor.

This section provides an overview of the licences sold at the regional level and within the study corridor and of the economic value of trapping activity at the County level. This information is collected by DNRE. An indication of trapping activity at the regional level and within the study corridor was also obtained by interviewing DNRE staff in the local offices.

The number of trapping licences sold by DNRE offices within the study corridor during 1987 to 1988 is shown in Table B-24. Table B-24 shows that 53 licences were issued in Harcourt and Rogersville, 159 licences were issued in Newcastle and Allardville, and 216 licences were issued in Bathurst and Petit-Rocher which is reflective of trapping activity in the Salisbury to Newcastle, Newcastle to Bathurst and Bathurst to Belledune portions of the study corridor, respectively. Although a total of 159 licences were issued for the Newcastle to Bathurst portion of the study corridor, the majority of these licences either trapped very little or did not trap at all (B. Arbeau, pers. comm.).

It is not possible to isolate furbearer harvest statistics for the various incorporated communities and Parishes within the study corridor from the rest of County as fur harvest statistics are collected at the County level only. Table B-25 shows fur harvest results for the 1988 to 1989 season for Gloucester, Northumberland and Kent Counties. The Counties of Albert and Westmorland have not been included as only a small portion of these counties are within the study corridor and DNRE officials have indicated that trapping activities conducted by residents of these counties which occurs within the study corridor principally occurs within Kent County (J. Mundle; A. Goguen, pers. comm.). The Table indicates that the value of trapping activity for 1988 to 1989 was $143,077, $64,295 and $28,327 for Gloucester, Northumberland and Kent County, respectively.

TABLE B-24: TRAPPING LICENCES ISSUED BY DNRE OFFICES WITHIN STUDY CORRIDOR, 1987-1988

Location Of DNRE Office	Resident Fur Harvester	Minor Fur Harvester	Totals
Allardville	26	5	31
Newcastle	118	10	128
Rogersville	44	--	44
Bathurst	172	18	190
Petit-Rocher	26	--	26
Harcourt	9	--	9
TOTALS	395	33	428

DNRE = Department of Natural Resources and Energy

SOURCE: Cartwright (1988)

TABLE B-25: FUR HARVEST 1988-1989

Species	Average Price Per Pelt ($)	Number of Pelts Gloucester County	Value $	Number of Pelts Northumberland County	Value $	Number of Pelts Kent County	Value $
Coyote	37.91	247	9,364	65	455	51	357
Fox	28.40	583	16,557	102	2,958	63	1,827
Bobcat	1275.22	4	5,101	0	0	0	0
Marten	94.30	487	45,924	190	16,091	5	423
Fisher	179.01	10	1,790	2	260	0	0
Mink	44.58	400	17,832	264	12,038	123	5,608
Otter	43.08	63	2,714	43	1,720	17	680
Beaver	35.35	854	30,189	742	23,202	569	17,792
Muskrat	5.20	2086	10,847	2,366	7,050	489	1,457
Raccoon	19.16	144	2,759	46	520	16	180
TOTAL VALUE			143,077		64,295		28,327

SOURCE: Cartwright (1989)

Trapping activity within the portions of the study corridor are conducted mainly by part-time trappers (R. Currie; R. Babin; pers. comm.). There are few trappers for whom trapping is the only means of income. The activity is primarily used to supplement household income earnings during a period of the year with high unemployment (mid-October to the end of December). Trap lines are distributed throughout the study corridor. The number of active trappers will fluctuate in any given year depending on market prices for fur and availability of animals (D. Cartwright, pers. comm.).

Trapping in the Salisbury to Newcastle region is conducted mainly on the Canaan River. However, all rivers in the area are used for trapping to some extent, especially for mink (J. Mundle, pers. comm.). Other furbearers hunted in this section, especially near the Miramichi River region, include muskrat beaver and fox (R. Currie, pers. comm.). Beaver is heavily trapped the entire length of the existing powerline, from Salisbury to Rogersville, which runs east of Highway 126 (A. Goguen, pers. comm.). There are approximately 15 to 20 trappers in the St.-Louis area, trapping beaver and otter, while the Harcourt and Rogersville areas experience recreational trapping for rabbit (R. Babin, pers. comm.). The Barnaby River area experiences "good" trapping (B. Dubé, pers. comm.).

In the Newcastle to Bathurst region, trapping activities occur primarily in the Allardville area. Beaver is the main furbearer trapped, while marten is also trapped. Most of the trapping occurs at the head of the Tabusintac River (which is close to the proposed route), with some trapping occurring in the Bass River and Red Pines areas (E. Legacé, pers. comm.).

There are a great number of trappers in the Bathurst to Belledune region of the study corridor. The 200 to 300 trappers working all the watercourses are enough to warrant the formation of the Bathurst Trappers Council (G. Godin; A. Madden, pers. comm.). Beaver is the main furbearer trapped, other furbearers trapped include marten, fisher, weasel, otter mink, fox, bobcat, raccoons, rabbit (recreational) and coyote (of which there are a great number in the North Shore region) (G. Godin; P. Tatlock; J. Furlotte, pers. comm.).

The marten is one of the most important furbearers in New Brunswick. As a result of a keen interest in marten by the fashion industry, marten was the most valuable furbearer, and accounted (with beaver) for 57 percent of the wild fur value during the 1986-1987 season, with an average increase for marten pelts of approximately 80 percent from 1985-1986. (Cartwright 1987). There was a small decline in marten prices during the 1987-1988 season; however, marten (and beaver) accounted for 58 percent of the wild fur value in New Brunswick (Cartwright 1988). A total of 1,559 marten valued at $132,032 were trapped during the 1988-

1989 season (Cartwright 1989). Marten are common in the northern portion of the study corridor, with 5 pelts recorded for Kent County, 537 pelts in Restigouche County, 92 in Gloucester County, 137 pelts in the Northumberland County-Northern Zone, and 53 pelts in the Northumberland County-Central Zone during the 1988-1989 season (Cartwright 1989). Marten (and beaver) accounted for 59 percent of the wild fur value; however, marten and many other species, realized a 50 percent or greater decline in harvest from 1987-1988, which was a result of a reduction in the season from seven weeks to two weeks (Cartwright 1989).

Mining and Mineral Resources

The Salisbury to Newcastle region is underlain by flat-lying Carboniferous sedimentary rocks that could host gas and oil, coal, salt, potash, gypsum, anhydride and silica sandstone. Coal deposits are found near Harcourt. No metallic mineral occurrences of economic interest are known in the southern portion of the corridor, although there are several manganese-rich bogs and peat deposits, some of which may have potential for development (L. Davies, pers. comm.) The only known area of significant mineral potential in the southern portion of the corridor is the Beersville Coal Deposit (Mining Licences 1272A and 1272B). There is little potential for oil or natural gas; if such deposits existed, they would be in the Salisbury area. There is a development plan underway for this region. The area presents difficulties for transmission line construction because of the numerous strip mining activities within the claim.

The Newcastle to Bathurst portion of the study corridor covers part of the most heavily staked area in the Province, the area west of Bathurst. A major commercial operator is Brunswick Mining and Smelting Corporation, which operates a large mine southwest of Bathurst. Others are Elmtree (two leases) and Eastwest Caribou.

The northern portion of the corridor is underlain by much older rocks with a relatively high mineral resource potential. Large deposits of zinc-lead-silver-copper-gold sulphides have been found, i.e., at Brunswick Mining and Smelting No. 12 mine. This region will probably continue to be intensively explored for mineral deposits (G. Greer, pers. comm.). Whatever the final right-of-way selected, the mineral rights will remain with the Crown. There are possible sink holes in the Belledune area in a region of limestone deposits, but they are not a major problem.

An area centred on Belledune Point and the smelter, north of the tracks, has been reserved from prospecting and staking; an area west of Hodgin, south of the tracks, has restricted prospecting rights (E. Jackson, pers. comm.). Other areas may be withdrawn in the future.

The corridor between Belledune and Brunswick Mines is a patchwork of mining leases, licenses and claims. Claims and licenses are not a constraint in terms of transmission line placement. Under new regulations, by June of 1989, licences must either be restaked as claims or put into production under a mining lease (E. Jackson, pers. comm.). A mining lease has a twenty year term, renewable three times for a total of 80 years. Mining leases in this portion of the corridor are as follows:

- Eastwest Caribou, a new lease and a producing mine since fall of 1988;
- Elmtree, a limestone producer with three leases, two of which are in production; two of the Elmtree leases are within the study corridor (#247 and #248); and
- Brunswick Mining and Smelting Corporation Ltd., which operates the largest zinc mine in the world at site number 12; site six, to the south, is no longer in production, and reclamation efforts are now underway. The number 12 site will be in production for the next 25 to 35 years (R. Schwenger, pers. comm.). The site is composed of an underground mine, a concentrator, an open pit quarry for backfill, and pollution control ponds.

Active bedrock quarries are located throughout the northern portion of the corridor. Deposits of quality bedrock material with active permits are as follows:

- the Nepisiguit Narrows Deposit southwest of Bathurst Mines;
- the Blue Mountain Deposit near Highway 430 west of the Pabineau Indian Reserve; and
- the Rough Waters Deposit at Gloucester Junction south of Bathurst.

Significant aggregate deposits are located as follows:

- the dump area between Belledune Station and Hodgin;
- the Nepisiguit River between Middle Landing Rapids and Bathurst where there are numerous areas in production;
- the junction of the Little River and the South Branch Little River; and

- the Meadow Brook and Nepisiguit River areas south of Bathurst Mines.

Peatlands

Peatlands of commercial value are located in the Salisbury to Newcastle and Newcastle to Bathurst regions from Catamount (northwest of Moncton) north to East Beaver Brook (north of Newcastle) (J. Thibeault, pers. comm.). Bogs 16, 39 and 40 (Figure B-7) have development potential, but which have not yet been developed. Bog 40 will be subject to a peat lease in the near future, and may be in production by the time transmission line construction begins (B. Evered, pers. comm.). Although peat is considered a quarriable substance (Keys and Henderson 1987), they are considered here as a natural resource.

More than 20 peatlands are currently leased from the Province for the production of horticultural peat (Keys and Henderson 1987). One of these lies within the study corridor:

- Bog 41, Birch Ridge Bog (Peat Lease 25, Les Tourbieres Kent), a double bog currently under production, located at Birch Ridge (Figure B-7).

Maple Sugar Operations

Sugaries or sugar bushes are located generally in the northern portion of the corridor in the Belledune to Nepisiguit River area west of Bathurst, as follows (D. Cyr, pers. comm.).:

- Landing Brook west of the Nepisiguit River and southwest of Bathurst Mines;
- Highway 360 at the east end of the corridor south of Bathurst;
- between Bathurst Mines and Highway 430;
- Middle River;
- north of Tetagouche River;
- west end of Big Meadow northwest of Dauversiere; and
- Elmtree River north of Dauversiere.

A total of five privately-owned sugaries are located within the corridor, all in the northern portion near Belledune. These are located as follows (D. Cyr, pers. comm.):

- west of Sormany;
- Dauversière;
- north of Alcida (2); and
- northwest of Belledune Lake.

The location of potential sugaries was not investigated.

DNRE administers all sugaries on Crown land; privately owned sugaries are not covered under the DNRE licensing process (D. MacFarlane, pers. comm.). Applications for sugary leases are sent to the District offices and eventually to the Regional Office. Final approval occurs in Fredericton at the Provincial Office. There is also input from the Department of Municipal Affairs and Environment. All lease applications are subject to criteria related to cutting, harvesting, road building and stream crossings.

Airports and Regional Air Traffic

Airstrips are registered under Transport Canada jurisdiction; those that are not registered are usually privately-owned strips located in fields or other similar areas. Registered airstrips are certified or licensed as to status under four codes (Code 1 to 4), ranging from small, non-instrument landing airstrips (Code 1) to major international airports (Code 4). The certification or licensing of airstrips depends on certain Transport Canada regulations pertaining to the landing of commercial carriers and the proximity to residential areas (G. Cooper, pers. comm.). Code 1 airstrips can be either zoned or unzoned; however, zoning is usually done only at the major airports.

The Air Navigation Group of Transport Canada (L. Cormier, M. Reid, pers. comm.) provided information on the two major and four minor airports within and near the transmission line corridor. The Instrument Landing System (ILS) is used by airports within the study corridor. The Rogersville airstrip is a certified Code 1 airstrip but has no Instrument Landing System. There is one 482 m (1585 ft) turf runway (M. Reid, pers. comm.). It is located on the west side of Highway 126 south of Rogersville and is operated by Maritime Air Services Ltd.

The Canadian Forces Base Chatham is a military airbase, used by military air traffic only. Chatham is presently a Department of National Defence (DND) airport. However, Transport Canada will probably be taking over the administration of the airport within two to three years (M. Reid, pers. comm.).

The Bathurst airstrip is a Code 3 airstrip operated by the Bathurst Regional Airport Commission Inc. The runway is 1,219 m (4000 ft).

The Tabu airstrip is a Code 1 (non-instrument) airstrip with two 2,400 ft runways which are used by the Forest Protection Service for spruce budworm spray operations and by DNRE for forest fire surveillance. It is located in the Highway 8 corridor.

The Rosehill airstrip, located west of South Tetagouche, is inactive at present, and is not currently a registered airstrip.

The Belledune airstrip is a non-certified, privately-owned airstrip, and has a runway 3,300 feet long (R. Ritchie, pers. comm.). The airstrip is owned and operated by Brunswick Mining and Smelting Ltd. and is located southeast of their facilities in Belledune.

The southern portion of the corridor is located within a zone of high aircraft activity which extends from the Moncton-Fredericton region to Chatham. Air Nova flights regularly travel between Moncton and Bathurst. Local pilots must be knowledgeable of the periods of activity out of the Dunphy airstrip at Blackville, which is a centre for DNRE fire patrols. There is also a great deal of uncontrolled, non-instrument traffic out of Moncton which use this airspace (M. Reid, pers. comm.).

Outfitting

The Tourism Development Act defines an "outfitters camp" as a tourism establishment providing sleeping accommodation for "sportsmen" (term used in Act but not defined). Although not specifically defined in the Act, an outfitter is one who operates an outfitters camp. A "guide" is defined in the **Fish and Wildlife Act** as any resident over the age of eighteen years of age who has passed an exam and taken an oath of office and has been licensed by the Minister of Natural Resources and Energy. Outfitters offer the services of professional Guides to residents and non-residents. Non-residents are required under the **Fish and Wildlife Act** to be accompanied by a licensed Guide while hunting and fishing for salmon in New Brunswick.

DNRE and DTRH both have responsibilities in relation to the outfitting industry. DNRE is responsible for the administration and protection of natural resources in the Province which are used by the outfitting industry (M. Fitton, pers. comm.). DTRH is responsible for industry accommodation regulation, development and marketing (W. Ensor, pers. comm.).

Although the outfitting industry has been considered to be of long-term economic importance to the Province, it has never studied in a comprehensive fashion to determine its value (W. Ensor, pers. comm.). Due to the lack of information, a survey of the six outfitters in the Province, who have a potential to operate within or close the study corridor boundaries was conducted to obtain data relevant to their use of the study corridor. The six outfitters were determined through discussions with DNRE regional staff (T. Pettigrew; B. Dubé; R. Currie; A. Madden; G. Godin; pers. comm.) and through a review of the official 1989 Guide to Outfitters in New Brunswick.

The survey consisted of telephone interviews with outfitters. The questionnaire and list of outfitters surveyed is found in Appendix E. The goal of the survey was to obtain a general appreciation for the level and types of outfitting activity which occurs within the study corridor, and where and when within the study corridor that this activity occurs.

The six outfitters surveyed offer a variety of services and facilities for fishing and hunting enthusiasts. The Miramichi and Salmon Rivers have attracted Atlantic salmon sport fisherman for many years. The clientele are predominantly from the United States but some come from as far away as Switzerland (W. Ward; pers. comm.). Trout fishing is very popular on the Northwest Miramichi River as well, due to sea-run trout.

The white-tailed deer is the most highly prized and sought after game animal in New Brunswick and Guides can greatly increase the success of a deer hunt. New Brunswick supports a large black bear population, and with two seasons offered annually (spring and fall), more than forty percent of non-resident hunters take at least one bear. Bear hunting has become very popular over the last few years (W. Ward, pers. comm.). In addition to fishing salmon and trout, and hunting deer and bear, sportsmen enjoy the excellent ruffed grouse and woodcock hunting provided by different forest growth stages in the area.

The findings of the outfitters survey include the following:

- an outfitter from Kent County uses the Salmon River along Route 116 to Harcourt which lies within the study corridor; this area is used from May to

December for hunting deer and woodcock, and fishing salmon and trout. Concerns include environmental aesthetics, health effects, and wildlife endangerment. (J. Mills, pers. comm.);

- an outfitter from Northumberland County uses the Northwest Miramichi River and occasionally travels into the transmission line corridor (W. Ward, pers. comm.); and

- approximately ninety-five percent of the clientele are non-resident and predominantly from the United States.

Fox Farms

Discussions with the New Brunswick Department of Agriculture revealed that there are approximately 33 fox farms located in the agricultural districts which are passed through by the proposed route. However, only six of these farms are located within the study corridor (D. Balzer; C. Goguen; P. Cyr; pers. comm.).

These six fox farms are located near Salisbury, which is known locally as the "fox farm capital". Fox farming has been an important component of the economic base of Salisbury in the past. However, due to the recent downturn in the fox fur market, the number of fox farms is rapidly decreasing.

Each fox farm owner within the study corridor was contacted to determine the precise location of the farms relative to the proposed route. The size of the farms in the vicinity of the proposed route range from 30 to approximately 200 females (B. Price; R. Carson; B. Williams; R. Steeves; C. Young; L. Lynn; pers. comm.). All are located within a small distance of each other.

B.2.2.3 Private and Crown Land

Crown lands, under the control and supervision of the Crown Lands Branch, DNRE, comprise the large majority of land in most Parishes within the study corridor (Table B-26). However, in the Parishes of Chatham, Coverdale, Derby, St. Paul and Weldford, Freehold property comprises more than fifty percent of land ownership within the Salisbury to Newcastle portion of the study corridor. In the Parish of Chatham, Freehold property comprises 22,616 ha and more than 90 percent of the land area, while Crown land accounts for only 2,484 ha. The Parish of

TABLE B-26: DISTRIBUTION OF CROWN AND FREEHOLD LANDS FOR PARISHES WITHIN STUDY CORRIDOR *

	CROWN LANDS		**FREEHOLD LANDS****		
PARISH	**Ha**	**%**	**Ha**	**%**	**TOTAL**
Salisbury to Newcastle					
Acadieville	48,607	59.08%	33,670	40.92%	82,277
Chatham	2,484	9.90%	22,616	90.10%	25,100
Coverdale	19,129	27.06%	51,572	72.94%	70,701
Derby	3,238	19.70%	13,200	80.30%	16,438
Glenelg	70,068	55.71%	55,703	44.29%	125,771
Harcourt	262,866	90.90%	26,324	9.10%	289,190
Nelson	54,209	56.99%	40,903	43.01%	95,112
North Esk	739,684	87.53%	105,426	12.47%	845,110
Rogersville	44,614	54.34%	37,491	45.66%	82,105
St. Louis	29,139	44.65%	36,129	55.35%	65,268
St. Paul	16,672	29.69%	39,485	70.31%	56,157
South Esk	577,128	91.85%	51,230	8.15%	628,358
Weldford	68,195	43.25%	89,499	56.75%	157,694
Subtotal	**1,936,033**	**76.76%**	**603,248**	**23.24%**	**2,539,281**
Newcastle to Bathurst					
Allardville	123,746	76.03%	39,004	23.97%	162,750
Bathurst	299,211	75.17%	98,837	24.83%	398,048
Newcastle	115,061	68.76%	52,282	31.24%	167,343
Subtotal	**538,018**	**73.89%**	**190,123**	**26.11%**	**728,141**
Bathurst to Belldune					
Beresford	61,289	44.29%	77,083	55.71%	138,372
TOTAL	**2,474,051**	**74.45%**	**870,454**	**25.55%**	**3,405,794**

* Incorporated Municipalities Excluded

** Freehold lands also includes Crown land under the administration and control of other Departments/Agencies (Transportation, NB Housing, Supply and Services).

Source: New Brunswick Department of Natural Resources and Energy, unpublished data.

Harcourt has the smallest amount of private holdings within the study corridor, with 262,866 ha accounting for almost 91 percent of the land area (DNRE, unpublished data).

Private Land

Large areas of private land are situated along the study corridor, in the following areas: Belledune and coast, Nicholas-Denys, South Tetagouche, Bathurst, Bathurst and Brunswick Mines, Newcastle to Beaverbrook Station and Chaplin Island Road, the northern and southern portions of Route 8, the Newcastle-Chatham to Barnaby River area, the Rogersville area and villages along Route 116, and the Salisbury to Monteagle area. Most of the remaining land, located generally away from the major highways and roads, is Provincial Crown land.

Provincial Crown Land

The legislative base for the granting of Crown land leases is the **New Brunswick Crown Lands and Forests Act**. Information on the number and location of Crown Timber licences and Crown campsite leases is provided in Sections B.2.2.2 and B.2.2.1, respectively.

Provincial Parks

There are three Provincial Parks within the study corridor: Steeves Mountain, The Enclosure and Tetagouche Falls, and one rest area, Greystone. Information on the location, services offered, and level of use of each of these facilities is provided in Section B.2.2.1.

Ecological Reserves

None of New Brunswick's declared or proposed Ecological Reserves are located within the corridor (M. Fitton, pers. comm.).

Canaan River Wildlife Management Area

This officially declared Wildlife Management Area is approximately 22,532 ha in area, and is located within the northwestern corner of Westmorland County, west of Canaan and Route 126. Only the eastern portion falls within the study corridor. It is administered under the **Fish and Wildlife Act (New Brunswick Regulation 82-4)** by the Fish and Wildlife Branch of DNRE which restricts hunting and trapping within the area.

The area is not actively managed. There is some old biological information, but little if any work has been done recently. There is apparently a high moose population in the area, and the area is within a moose study block. There is also a beaver/black duck study being conducted in the region. There are no guidelines that should be followed, and the area should be treated as other Crown land is treated (J. Patch, pers. comm.).

Federal Crown Land

Federal Crown land within the study corridor is described below:

- Beaubears Island, situated in the Miramichi River opposite Newcastle, is owned by the Canadian Parks Service, which has developed some low key tourist attractions: a hiking trail, a small portable wharf used by a municipal/private boat service on weekends, and a picnic site beside the wharf (N. Munro, pers. comm.). The island was left to the Canadian Parks Service by a local resident named O'Brien who stipulated that the island be left in a natural state. The Canadian Parks Service has no aspirations to develop the site any further (due to fiscal restraints and the constraints of the will), but has no difficulty with people using the area for low key tourism activities (N. Munro, pers. comm.). Beaubears Island is a Reserved Area (Order-in-Council 74-171); the mines and mineral rights have been transferred to the federal government;

- a Department of National Defense firing range is located at Nordin, near Newcastle;

- Chatham Air Force Base, located at Chatham; the base property is mostly outside of the corridor, but the flight space restricted area takes up most of the eastern portion of the Newcastle-Chatham area; and

- the Miramichi Fish Culture Station, administered under the Fisheries Research Branch of the Department Fisheries and Oceans, is located west of Newcastle on Route 420, at the mouth of Stewart Brook.

There are no Federal National Wildlife Areas or Migratory Bird Sanctuaries within the corridor (B. Johnston; A. Smith, pers. comm.).

Native Lands

There are two Indian Reserves within the study corridor:

- Eel Ground No. 2, west of Newcastle; and
- Pabineau No. 11, south of Bathurst.

Indian and Northern Affairs Canada is not aware of any land claims that have been accepted within the corridor; there could be future land claims in the Miramichi area, but INAC would have no knowledge about any until they occur (P. Adams, pers. comm.).

B.2.2.4 Communications

The general route for telecommunications is between Moncton and Newcastle, then between Newcastle and Bathurst. Microwave and radio towers are located at several points within the study corridor. Each utility has its own towers, but some sites are shared, and even some towers are shared. Sites located within or near the study corridor are as follows:

- Lutes Mountain - a major regional tower site, located east of the corridor between Salisbury and Moncton; this site is included because of its regional importance for communications;
- Adamsville - at least 3 tower sites are located east (1) and west (2) of the community;
- Rogersville - towers are located at two sites: within the Village west of Route 126, and east of the Village on Route 440;
- Bartibog - one tower site located north of the community, on the west side of Route 8;
- Ashton - a tower site is located a short distance outside the corridor boundary; one tower site is located a short distance inside the boundary; both are located on Route 430, the Chaplin Island Road;
- Daulnay - towers are located on the west side of Route 8 south of Daulnay;

- Allardville - a tower site is located south the village on the east side of Route 8;
- South Tetagouche - a tower site is located west of the community; and
- Guitar - a tower site is located on the Mitchell Settlement Road south of the existing transmission line corridor.

B.2.2.5 Historic and Archaeological Resources

The earliest evidence of human occupation of the region has been found at the Debert site in northwestern Nova Scotia (MacDonald 1968), less than 100 km from the study area. A secession of vegetation regimes followed with increasing and then fluctuating temperatures (MacDonald 1968; Allen 1980; Bonnichsen, et al. 1985). As the vegetation and associated fauna changed, so did the adaptations of the successive human populations through the Palaeo-Indian, Pre-Ceramic, Ceramic and Historic periods. Although there is some evidence of Palaeo-Indian presence on the northeast coast at the mouth of the Tracadie River (Keenlyside 1985), no evidence of occupation of the study area prior to the Pre-Ceramic Period, ca. 5,000-2,500 B.P. has yet been discovered.

Distribution of known sites in northeastern New Brunswick indicates that most cultural groups exploited the resources of the sea coast and river estuaries at least through the spring and summer (Ganong 1899). It is possible that, from the Palaeo-Indian period onwards, people travelled inland in fall and winter to seek over-wintering species such as caribou, hare and ptarmigan, and fish through the ice of lakes and rivers (WMS Associates Ltd. 1990).

This pattern changed during the early part of the Pre-Ceramic Period, when there was more emphasis on exploitation of interior resources, at least by people of the Laurentian Archaic tradition (Tuck 1984) and possibly also by Maritime Archaic Indians (Sanger 1973). Hunters and families of the Laurentian Archaic tradition, numerous in western New Brunswick, may have penetrated as far east as the study area and are represented at such major sites as Cow Point on Grand Lake. The earliest dated material in the vicinity of the study area is from the Augustine Mound site at the confluence of the Northwest Miramichi and the Little Southwest Miramichi, dated as early as 1950 B.P. (Turnbull 1976), and the Oxbow site (CfDl-1) at Red Bank, where Allen (1980) suggests that the first people to reside at this deeply stratified site were descendants of the amalgamated Susquehanna and Maritime Archaic cultures.

European contact with people in the vicinity of the study area began in the 16th and early 17th centuries with the voyages of explorers such as Cartier and Champlain and, subsequently, the travels of Jesuit and Recollet missionaries (Ganong 1899). Permanent European settlement began in the 17th Century, primarily near the coast and on major river systems, with the arrival of Acadian farmers and military forces. In the mid- to late-18th Century, Loyalists began arriving, although Acadians remained more numerous. From the early 19th century onwards extensive immigration from various parts of the Old World marked the beginning of the industrial period and establishment of the major towns and cities in the region.

A total of 44 archaeological sites is included within the corridor (A. Ferguson, pers. comm.), and are concentrated along the major waterways crossed by the corridor, specifically:

- the Salisbury area, along the Petitcodiac River (eight sites, seven of which have high potential significance);
- the Newcastle-Chatham area, along the Miramichi and the Southwest and Northwest branches (35 sites, 16 of which have high potential significance), including a concentration on Beaubears Island (11 sites, all of high potential significance); and
- around Bathurst Bay (outside of the corridor).

The cultural distribution of known sites, some of which have both a prehistoric and historic component, includes:

- twenty-one prehistoric sites or sites with prehistoric components;
- one prehistoric/historic Indian site;
- three Pre-expulsion Acadian sites;
- fifteen historic European sites of undetermined function or significance;
- three European industrial sites from the 18th-early 20th centuries;
- two sites related to historic European military activities; and
- one historic European cemetery.

Most of the prehistoric sites have suffered from some degree of erosion; a few appear to contain some intact deposits. The European sites vary in terms of integrity, but most seem to contain significant amounts of information with which the early archival history of European settlement, industry and subsistence can be augmented. The distribution of known sites along the major water courses reflects the pattern of European settlement, which has resulted in both the formation of historic sites and the finding of prehistoric sites through disturbance, and the pattern of previous archaeological surveys, which have been confined largely to the coast and major rivers.

The significance as defined above is **potential** only; further field research would be needed to confirm the initial observations and the integrity of any site. Even though no archaeological sites are recorded for an area, it does not follow that none are actually present. To date, only areas along the seacoast and major waterways have been inventoried. Although inland areas are not expected to yield sites in large concentrations, some highly significant areas could be present.

B.3 Route Selection Study

The most critical element of the development of an environmentally acceptable transmission line is to select a proposed route which avoids interaction with valued environmental components. To this end, a Route Selection Study is described in this chapter.

As described in the study strategy (Sections 1.6 and 1.7.1), the Route Selection Study is divided into six elements:

- select study corridor;
- describe biophysical/socioeconomic setting;
- public and local government consultation;
- identify routing constraints;
- analyze routing constraints; and
- select proposed and alternative routes.

The biophysical and socioeconomic settings are described for the study corridor in Sections B.1 and B.2 above.

B.3.1 Study Corridor Selection

The proposed 345 kV transmission line will interconnect terminal stations located near Salisbury, Newcastle, Bathurst and Belledune. Outside of environmental and socioeconomic constraints, it was necessary that the proposed route be as direct as possible to minimize the cost of construction and operation. The width of the study corridor was set at 15 km except where it narrowed south of Salisbury, where it widened slightly northeast of Salisbury, and where it widened considerably between Bathurst and Belledune (Figure 1-1).

The study corridor was based on a point in the centre of Beaubears Island in the Miramichi River near Newcastle. The corridor was extended north to Newcastle from Salisbury and included both sides of Route 126 between Nelson-Miramichi and Canaan, was pivoted on Beaubears Island at Newcastle, and followed the established railway and transmission line corridor north to Bathurst as a centre line. As one of the alternative routes to be selected along this section of the line, an additional 2 km corridor to the east along Route 8 was added.

A 15 km corridor was also followed between Bathurst to Belledune but was extended to the coast so that the present width is as much as 30 km.

B.3.2 Route Selection Methodology

Because of the large number of alternative route combinations, two procedures were developed to compare and screen all possibilities in order to identify the proposed route and its alternatives for more detailed study. These procedures were:

- a constraint mapping procedure and weighting system, after Williams and Massa (1983), which was developed for multiple route corridors in Wisconsin and Minnesota; and
- a computer program, PATHS, developed by WMS Associates Ltd. for this study to calculate the relative importance of the constraint classes.

These procedures are divided into several phases, which are detailed in the sections which follow:

- determination and mapping of constraints and constraint classes;
- determination and mapping of links and routes;
- determination of alternative routes using PATHS;
- measurement of the distances within each class for each link;
- calculation of constraint scores for each link using PATHS;
- determination of total constraint scores for each alternative route using PATHS; and
- reduction of alternative routes to the proposed route and its alternatives using the lowest environmental score.

All available existing information on the study corridor was obtained under three categories:

- biophysical;
- socioeconomic, including natural resources and resource use; and
- engineering and construction.

This information, which is described in Sections B.1 and B.2, was obtained through extensive personal communications and interviews with people knowledgeable of the land use and resources within the study corridor, and from available published and unpublished data. Constraints were identified from available mapped information, from interviews and correspondence with resource agencies, from experts at universities, and from meetings and correspondence with representatives of municipalities and LSDs situated along the corridor.

Immediately after initiating this project, a helicopter survey of the study corridor was undertaken to provide an overview of the terrain, vegetation cover, land use, and fisheries resources to pinpoint areas of interest and to give the study team a familiarity with the region.

B.3.3 Constraint Mapping

Constraint mapping is a useful concept when applied to the route selection process; a two-phase approach is usually followed in the development of the constraint mapping system (Passey and Wooley 1980; White 1981). Phase one involves the collection and graphic display of critical environmental information in the form of exclusionary areas. These areas determine the location and extent of corridors and routes. The mapping of these exclusionary areas aids in the elimination of various portions of the study area, resulting in the establishment of a number of routes or the reduction of the study area.

Phase two (Passey and Wooley 1980; White 1981) involves the production of additional constraint maps which summarize the information in the above map series. Graphic display of these summarized variables can be done by either stratifying the information in terms of specified groups, or mapping the information on transparencies which overlay a base map. This Route Selection Study used the former method of classification. Alternative routes were drawn in such a way so as to avoid areas of concern.

Route selection constraints fell under three broad categories:

- biophysical;
- socioeconomic; and
- engineering and construction.

The corridor was mapped on eight 1:50,000 scale topographic maps which divided the study corridor into eight roughly equal sections. The constraints were then grouped into four map categories and mapped on the series of eight working constraint maps, using various colours. This resulted in a total of 32 working constraint maps. Each series of constraint maps, for convenience, grouped together details of the following constraints:

- mining and geology;
- habitat/wildlife, including wetlands, forestry operations, deer yards, etc.;
- land use, including Crown and private land, parks, etc.; and

- residential, plus utilities, etc.

Information is portrayed on the constraint maps (Maps 1 to 8), and was ranked into four classes, reflecting the priority of avoidance, as follows:

Class 1 - High
This class includes the following: Indian Reserves, Federal land, provincial parks, Crown land camp site leases, concentrations of archaeological sites, sugaries on Crown land, mining facilities and activity areas of active mines, active bedrock quarries, microwave and radio towers, high density subdivisions, cities, towns, and airports with exclusion zones.

Class 2 - Moderate
This class includes the following: individual archaeological sites, peatlands having commercial potential, commercial peat extraction operations, plantations and thinned areas, high and moderate density ribbon development, commercial areas, wide expanses of river, and low capacity soils (bogs).

Class 3 - Low
This class includes the following: non-designated environmentally significant areas, sugaries on private land, privately owned land, coal deposit regions, mining leases, outlying areas of active mines, granular aggregate areas, sand and gravel pits, deer and moose wintering areas, fish resource areas, wetlands, existing Ducks Unlimited projects, miscellaneous peatlands, highway and road crossings at <60° and >120°, and low density ribbon development.

Class 4 - No Constraint
This class includes the following: provincial Crown land, mining claims, municipal water supply watersheds, potential Ducks Unlimited projects, agriculture land, railway lines, other transmission lines, and areas having no residential development.

Tables B-27 and B-28 present the biophysical and socioeconomic constraints and the weighted ranks used in the constraint mapping and route selection phases of this EIA Study. The ranks were derived on the basis of consultation with experts, government agencies, the public and through professional judgement.

TABLE B-27: BIOPHYSICAL CONSTRAINTS

CONSTRAINT	CLASS
Canaan River Wildlife Management Area	4
Natural Areas (non-designated)	3
Deer Wintering Areas	3
Fish Habitat	3
Wetlands	3
Ducks Unlimited Projects	
Existing Projects	3
Potential Projects	4
Engineering Constraints	
Wide Rivers (>457 m)	2
Low Capacity Soils (lengths >365 m - 457 m)	2

TABLE B-28: SOCIOECONOMIC CONSTRAINTS

CONSTRAINT	CLASS
Private Land	3
Crown Land	4
Federal Land	1
Provincial Parks	
The Enclosure	1
Steeve's Mountain	1
Greystone Rest Area	1
Tetagouche Falls	1
Indian Reserves	1
Residential Areas	
High Density Subdivision, Cities, Towns	1
High Density Ribbon Development	2
Moderate Density Ribbon Development	2
Low Density Ribbon Development	3
No Residential Development	4
Designated Water Supply Watersheds	
Nigadoo River	4
Middle River	4
Archaeological Sites	
Concentrations of Sites	1
Individual Sites	2
Mineral Claims	
Beersville Coal Deposit	3
Mines	
Facilities	1
Leases - Producing and Near-Producing Mines	3
Claims	4
Mineral Deposits	
Granular Aggregate Areas	3
Sand and Gravel Pits	3
Active Bedrock Quarries	1
Agricultural Land	4
Peatlands	
Commercial Potential	2
Developed Bog	2
Others	3

TABLE B-28 SOCIOECONOMIC CONSTRAINTS - CONTINUED

	CLASS
Forestry	
Plantations, Thinned Areas	2
Sugaries	2
Dumps	3
Railway Lines	4
Power Lines	4
Highways/Roads	3
Crossings at <60° and >120°	3
Microwave and Radio Towers	1
Crown Land Camp Site Leases	1
Commercial Areas	2
Airports - with avoidance zones (1.5-4 km)	
Rogersville	1
Chatham	1
Bathurst	1
Tabu (Highway 8)	1
Rosehill (South Tetagouche)	1

Each of the constraint classes listed above was then assigned a weighting factor, as follows:

- Class 1 (High) - weighting factor 6.0;
- Class 2 (Moderate) - weighting factor 4.0;
- Class 3 (Low) - weighting factor 2.0; and
- Class 4 (No Constraint) - weighting factor 1.0.

A series of eight constraint summary maps were then constructed from the 32 working maps, on which only the four constraint classes were drawn.

A socioeconomic exclusion zone was established as a constraint criterion. Such a zone included the avoidance of federal lands, airport restrictions, municipal boundaries, etc. The study corridor was reviewed at local government information sessions (Section B.3.5) with the officials of villages, towns and LSDs which were located within or near the corridor. Full consideration was given to municipal boundaries, zoning by-laws, Basic Planning Statements, and municipal land use conflicts and other issues and concerns expressed by municipal and LSD representatives.

Specific confirmation of the rationale for:

- residential constraint classes;
- airport avoidance zones and restrictions; and
- municipal and LSD restrictions,

are detailed in Appendix F, and were solicited by letter, telephone, and at the local government information sessions (Section B.3.5) and at the open houses (Appendix G). The constraints and constraint classes were also presented to the EIA Review Committee, and at open houses (Appendix G).

The general aim of any utility is to build the power line in as straight a line as possible, using the less expensive tangent structures, and avoiding expensive angle structures and other specific designs, unless necessary. However, lines may have to be angled around areas, resulting in more expense in the form of angle structures and increased distance. Some important engineering and construction constraints (NB Power, pers. comm.) are detailed below:

- river crossings should not exceed 457 m; less is preferred; ideally, the crossings should have some relief, at least 9.1 to 12.2 m banks, so as to eliminate the need to build high crossing structures;
- lengths of greater than 365 to 457 m of continuous swampy or peat-like ground should be avoided, as towers need a firm footing in order to be effective; this is especially true at angle structure and dead end structure locations;
- NB Power prefers to intersect primary and major secondary roads as close as possible to 90° and not less than 60° or greater than 120°, so as to avoid extensive transmission line vistas; although it is preferred to cross roads and ridges at 90°, any reasonable angular relationship is preferred to putting a number of expensive angle structures in place in order to achieve the 90° intersection; the straightest possible alignment is normally preferred; and
- angle and dead end structure locations should be located at higher points relative to adjacent structures; angles should be maintained at less than 45°; and, in steep terrain, transmission line alignments should avoid being parallel to and on the tops of ridges; the crossing of ridges should be at lower points and as close to 90° as possible.

B.3.4 Selection of Potential Routes

B.3.4.1 Preliminary Field Investigation

An intensive field investigation program was conducted in order to identify "windows" in built up areas. "Windows" are spaces between houses in settled areas along highways and roads of sufficient width to allow passage of a 50 m transmission line right-of-way within a reasonable distance from the occupied residence. The objective of the field investigation was to identify potential road crossings within the corridor.

The field investigation focused on road crossings in the following built-up areas:

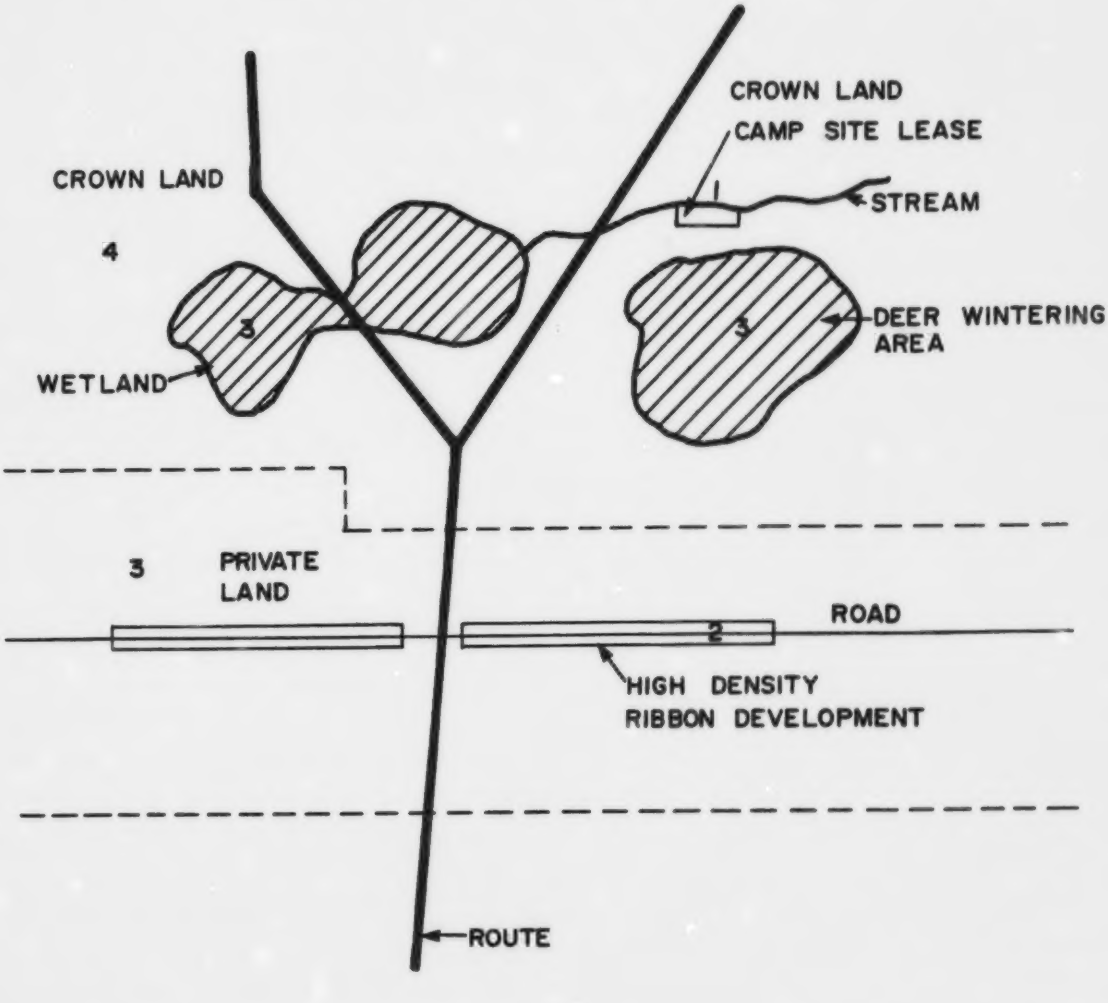
- the areas east, west and south of Salisbury, and the Salisbury to Monteagle area;

- the communities of Harcourt, Rogersville and Barnaby River;
- the Southwest and Northwest Miramichi River crossings west of Newcastle;
- the Cross Roads area at the Newcastle terminal;
- Telly Road Crossing, north of Newcastle;
- the areas south and southwest of Bathurst (Chamberlain Settlement, Gloucester Junction and Blue Mountain Settlement); and
- the South Tetagouche, Sormany, Nicholas-Denys and Dauversière areas west of Bathurst.

Locations of residences and out buildings in the above areas were marked on LRIS property maps during the field investigation. "Windows" were identified on the maps and critically assessed for suitability while in the field. The field investigation was most critical along the four highways bordering the Southwest and Northwest Miramichi Rivers in the Newcastle area, as "windows" had to line up to cross four roads in very built-up areas, and in the Salisbury area where there is considerable development and a number of ribbon settlements. Important natural areas and other critical constraints were also surveyed during the preliminary field investigation. Current land use was also confirmed in the critical areas listed above.

B.3.4.2 Determination Of Potential Route Links and Preliminary Alternative Routes

A series of **potential route links** was drawn on the eight working summary constraint maps, taking into account all of the constraints listed in Tables B-27 and B-28. A link is defined as that portion of an alternative route between a point of intersection of two alternative routes, inclusive of angles; the point of intersection of two links is a node (after Williams and Massa 1983). All links are identified and labelled Maps 1 to 8. A sample constraint map (Figure B-10) demonstrates the formation of potential route links by the avoidance of constraints. Each link of the routes drawn on the working maps was assigned a number, starting at the Salisbury terminal and working northwards, first to Newcastle, then Bathurst, then Belledune. New links added or modified after numbering was completed were assigned numbers which followed consecutively after the last number at Belledune. PATHS required dummy in or out links at all four terminals; these were included as part of the numbering system (Section B.3.6).


CROWN LAND
4
WETLAND
3
CROWN LAND
CAMP SITE LEASE
1
STREAM
3
DEER WINTERING AREA
3
PRIVATE LAND
ROAD
2
HIGH DENSITY RIBBON DEVELOPMENT
ROUTE

LEGEND

CLASS 1 - HIGH
2 - MODERATE
3 - LOW
4 - NO CONSTRAINT

SAMPLE CONSTRAINTS MAP

wms associates ltd.
ENVIRONMENTAL CONSULTANTS AND SCIENTISTS

FIGURE No.: B - 10	JOB No.: 2945
SCALE: N.T.S.	DATE: 90 05 02

A number of general routing objectives were followed during the process of selecting the preliminary routes:

- avoidance of private land;
- avoidance of residential areas;
- to follow existing corridors where possible;
- to minimize the total length of the line;
- to identify at least three potential routes between Salisbury and Newcastle (east, west and central) with at least two potential crossing locations for the Miramichi River;
- to identify at least two potential routes between Newcastle and Bathurst including a route within 1 km of Route 8; and
- to identify at least two potential routes between Bathurst and Belledune.

In addition, other general engineering and property factors were considered in the selection of potential route links and routes:

- the minimization of the number of angles;
- the avoidance of steep terrain;
- the minimization of the number of watercourse crossings, particularly major rivers;
- the avoidance of soils with low load bearing capacity; i.e., peatland and wetland; and
- the minimization of the diagonal severance of properties.

The network of links and routes was selected to meet the above general routing objectives to obtain a set of preliminary alternative routes.

B.3.4.3 Route Verification

The second phase of the field investigation program involved the verification of the preliminary alternative routes to ensure there were adequate "windows" and no other serious resource conflicts. Each crossing of a preliminary alternative route within or near residential areas was inspected and photographed, and the actual "window" assessed for suitability. Some assessments resulted in the repositioning of the crossing and the subsequent realignment of the route. The road crossings were located on LRIS property maps and later reviewed for technical and engineering feasibility by NB Power. Preliminary alternative routes crossing wilderness or uninhabited roads were not field checked if:

- the road was snowed in or otherwise inaccessible; or
- there were no electric power distribution lines present, indicating absence of residences.

B.3.5 Local Government Information Sessions

During the early phases of the Route Selection Study in late 1988, NB Power decided that it was necessary to consult with representatives of local governments within the study corridor to obtain their input regarding potential routing issues and conflicts. It was felt that local government representatives tend normally to be the spokespersons of their communities, and also, they are typically knowledgeable of their constituents views, concerns, activities and livelihood.

A series of eight information sessions were held at strategic locations along the route:

- Salisbury;
- Harcourt;
- Rogersville;
- Nelson-Miramichi;
- Allardville;

- Bathurst;
- Pointe Verte; and
- Belledune.

These sessions were held in March and April 1989 following identification of preliminary alternative routes as outlined in Section B.3.4.2, but prior to route verification. It was felt that this would be the best time to meet with local government representatives as they would be able to review all preliminary alternative routes before they were "cast in stone". The sessions were very useful in identifying routing constraints and route preferences, providing information on local resource-based activities, and were also very useful for the identification of valued environmental components for the EIA study (Chapter Three).

The final Guidelines for the EIA study required that NB Power consult with those potentially affected by the proposed transmission line during the course of the EIA study. While the local government information sessions contributed to this process, public open houses were held in early 1990 to satisfy this requirement more fully. These are described in Chapter Three and in Appendix G.

The information sessions were broken down into three sections:

- structural presentation;
- question and answers session; and
- informal discussions with coffee and donuts.

The agenda for the information sessions consisted of the following:

- introductory remarks;
- purpose of the session;
- objectives of the study;
- schedule and milestones;

- methodologies and output;
- progress to date;
- questions and input; and
- informal post-session discussions.

After the sessions, discussions took place between NB Power and WMS Associates Ltd., and small groups of local government representatives, the purpose of which was to receive detailed input and verification regarding biophysical conditions, land use and activities and to further emphasize the objectives of the study.

The elected representatives of the local communities and Chairpersons of Local Service Districts (i.e., within the corridor and within a 30 to 40 km radius of the venue) received personal invitations to attend the sessions from NB Power.

After each session, summaries of the main areas of discussion, obvious areas of public concern and a general impression regarding potential issues were prepared. The following sections summarize the salient points raised in the eight information sessions held. Overall, the tone of all meetings was positive.

Salisbury

The Salisbury session, March 22, 1989, was attended by members of the Salisbury Village Council. The preliminary alternative routes pass well away from the Village boundaries. There was general agreement that there was not as much room to the east and that the western route seemed the most desirable. Questions concerning herbicides, EMF and radio/TV interference were raised, but the Village had no major concerns in this regard.

Harcourt

The Harcourt session, March 21, 1989, was attended by representatives from the LSDs of Harcourt and St. Paul. There was little opposition to any of the preliminary alternative routes presented, although there was apparent agreement that the best route would be along the western side of the corridor away from the wetlands near Route 126 and the populated areas along Route 126. Concern regarding EMF was raised on an individual basis with the NB Power officials. There were some questions regarding the use of herbicide by NB Power. There was some interest in how people would be compensated for their woodlots, land, and crop damage.

Rogersville

The Rogersville session, March 29, 1989, was attended by representatives of the Village of Rogersville, and the LSDs of Collette and Acadieville. There were questions about herbicide spraying and EMF, radio and TV reception, and the effect on deer populations and game meat quality. There were concerns about how close the line would come to the Rogersville Village boundary, and any inhabited areas.

Newcastle Area

The Newcastle area meeting, April 13, 1989, held in Nelson-Miramichi, was attended by representatives from the Town of Newcastle and other districts in the area. It was emphasized by NB Power that the portion of the study corridor east of the REPAP plant was too congested for any line to be seriously considered; there was general agreement on this issue.

Allardville

The Allardville session, April 19, 1989, was attended by representatives of the LSDs of Allardville and Allardville Centre. There was little opposition to the preliminary alternative routes presented except some concerns about private land along the Route 8 corridor. The local officials seemed to prefer the preliminary alternative route along the railroad tracks.

Bathurst

The Bathurst session, April 26, 1989, was attended by representatives from the City of Bathurst. City officials questioned the reason for a new line in view of the recently constructed existing 345 kV line from Eel River. Other concerns included: the height of the towers at the Bathurst airport and the possibility that a plane may collide with one; the crossing of City limits by the proposed line; microwaves and their affects; the servicing of Brunswick Mines and other large industries; potential new mining areas; and the impact on the routing of the line if the thermal plant was to be built at Belledune. The corridor crosses the water supply watershed, which is currently undergoing a Watershed Designation Study. The effect of a proposed watershed buffer zone on the transmission line was questioned.

Pointe Verte

Representatives of Pointe Verte Village Council, and the LSDs of Alcida/Dauversière and Nicholas-Denys attended this session, which was held in Pointe Verte, April 26, 1989. Village officials were concerned that the line not enter the Village boundaries. There was general consensus that the line not go through or near any populated area, and that the western option would not be opposed. It was thought that a direct line to Belledune from Newcastle (a scenario being considered at that time) was not needed since a line to Bathurst would complete the planned circle of the Province. Concerns about radio interference, the effects on people and wildlife, cancer, herbicides, grubbing of the right-of-way, and access roads were also raised.

Belledune

Members of the Belledune Village council, the Belledune Planning Commission, and the LSD of Armstrong Brook attended this session, which was held on April 25, 1989, in Belledune. Discussions concerned the proposed new Belledune thermal generating plant, and the final destination of the line (Belledune or Bathurst), if it were to be built. It was pointed out that there is already a 345 kV line between Eel River and Bathurst. Belledune and Pointe Verte are planning extensions of their Village boundaries, and requested that this must be taken into consideration. Other questions concerned wood cut from the right-of-way, the location of the proposed NB Power ash disposal field for the proposed Belledune Generating Station, the location of the water supply watershed and the impact upon it, the exact location of the proposed line, and the use of herbicides.

B.3.6 Analysis of Potential Routes

A computer program called PATHS was developed by the WMS Associates Ltd. to identify all possible preliminary alternative routes. The concept of PATHS involved the evaluation of each preliminary alternative route to determine its length and cumulative constraint score. The initial evaluation could be made using the complete route or a partial route to examine the sensitivity to constraint parameters in specific areas.

The program methodology involved a decision-tree process based on individual links. From each numbered "link" or segment of the route, the possible alternative paths which could be taken were determined. Since each link could have up to three options, a large number of path combinations were possible. Some link combinations were excluded because of impracticality, i.e., reverse direction or a seriously divergent path. A sample PATHS tree and output is presented in Figure B-11.

The methodology employed by PATHS required a number of "in" and "out" links to indicate the beginning and the end of each series of links, as follows:

- link 1, the Salisbury in link;
- link 84, the Newcastle in/out link;
- link 80, the Bathurst in/out link; and
- link 100, the Belledune out link.

A total of 100 links were defined, along with their link options (Table B-29), however many of these were later deleted when some of the preliminary alternative routes were modified as a result of the route verification process. The links used in the analysis are shown on Maps 1 to 8.

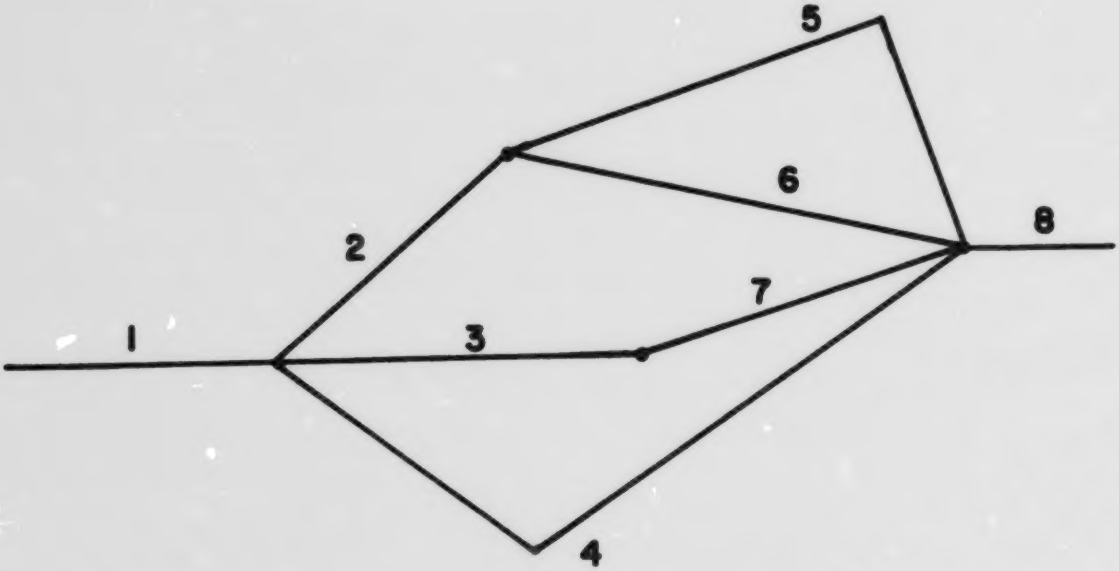
PATHS determined the total length of the route and the cumulative constraint score or "weighted length" for each possible route. The routes were then sorted by cumulative constraint score. The lowest score reflects a combination of a low degree of interaction with constraints and short length.

To determine the "weighted length" of a preliminary alternative route, the total length in kilometres of each link within each of Classes 1, 2, 3 and 4 was determined by measuring the distances on the base map and entering the sums into PATHS. The score for each link was calculated by multiplying the constraint factor by the length of each class, as follows:

Link 1 Score = (Class 1 km x 6) + (Class 2 km x 4) + (Class 3 km x 2) + (Class 4 km x 1)

The constraint factors or weights for each class were based on Williams and Massa (1983).

The cumulative weighted score of a preliminary alternative route was determined by adding up the total score of each link in the route, as follows:



INPUT

LINK	DEFINED OPTIONS
1 IN	2 3 4
2	5 6
3	7
4	8
5	8
6	8
7	8
8 OUT	

OUTPUT

ROUTE	LINKS			
1	1	2	5	8
2	1	2	6	8
3	1	3	7	8
4	1	4	8	

SIMPLIFIED PATHS TREE AND OUTPUT

wms associates ltd.
ENVIRONMENTAL CONSULTANTS AND SCIENTISTS

FIGURE No.: B-11	JOB No.: 2945
SCALE: NTS	DATE: 90 05 02

TABLE B-29: PATHS PROGRAM LINKS AND OPTIONS.

		OPTION			
LINK	**LENGTH**	1	2	3	
1	0	3	34	0	Salisbury
2	.1	0	0	0	
3	3.4	7	0	0	
4	1.95	0	0	0	
5	1.4	0	0	0	
6	2.9	0	0	0	
7	2.75	10	0	0	
8	.5	0	0	0	
9	1.15	0	0	0	
10	.75	11	13	0	
11	.4	12	0	0	
12	25.25	14	15	0	
13	30.05	16	0	0	
14	5.15	16	0	0	
15	62.6	19	0	0	
16	45.65	17	18	0	
17	4.25	52	0	0	
18	5	89	90	0	
19	21.5	20	60	0	
20	7.85	21	0	0	
21	6.35	22	0	0	
22	4.5	66	78	84	
23	10.05	0	0	0	
24	37.3	0	0	0	
25	40.45	0	0	0	
26	2.95	0	0	0	
27	4.75	0	0	0	
28	4.95	0	0	0	
29	9.3	0	0	0	
30	2.75	0	0	0	
31	2.3	0	0	0	
32	6.4	0	0	0	
33	1.3	0	0	0	
34	1.25	39	0	0	
35	.15	0	0	0	
36	3.7	0	0	0	
37	2.7	0	0	0	
38	1.1	0	0	0	
39	1.25	40	0	0	
40	2.4	41	0	0	
41	2.85	44	0	0	
42	2.4	0	0	0	
43	.65	0	0	0	
44	.65	46	0	0	
45	3.1	0	0	0	
46	1.85	50	0	0	
47	2.5	0	0	0	
48	.65	0	0	0	
49	5.35	0	0	0	
50	5.9	51	0	0	
51	64.25	52	0	0	
52	8.95	53	54	0	
53	3.3	91	0	0	
54	8.7	55	56	0	
55	8.95	57	0	0	
56	17.85	61	0	0	

Table B-29: PATHS PROGRAM LINKS AND OPTIONS - continued

LINK	LENGTH		OPTION		
		1	2	3	
57	4.55	58	59	0	
58	5.25	61	0	0	
59	5.15	20	60	0	
60	2.95	62	0	0	
61	1.3	62	0	0	
62	4.95	65	0	0	
63	5.85	0	0	0	
64	7.1	0	0	0	
65	4.1	66	78	84	
66	7.15	67	0	0	
67	6.75	73	0	0	
68	23.65	0	0	0	
69	16.1	0	0	0	
70	8.35	0	0	0	
71	43.45	0	0	0	
72	6.35	0	0	0	
73	15.8	74	0	0	
74	.5	77	0	0	
75	10.3	69	70	0	
76	17.45	71	0	0	
77	31.95	79	0	0	
78	70.5	79	0	0	
79	1.8	80	92	0	
80	0	92	0	0	Bathurst
81	0	0	0	0	
82	4.55	57	0	0	
83	0	0	0	0	
84	0	66	78	0	Newcastle
85	0	0	0	0	
86	0	0	0	0	
87	1.6	0	0	0	
88	66.85	0	0	0	
89	8.95	19	0	0	
90	15.5	82	0	0	
91	8.15	82	0	0	
92	8.15	94	95	0	
93	3.45	0	0	0	
94	8.25	96	98	0	
95	10.4	97	0	0	
96	4	97	0	0	
97	32.7	100	0	0	
98	4.3	99	0	0	
99	34.85	100	0	0	
100	0	0	0	0	Belledune

Cumulative Weighted Score (Route 1) = Link 1 Score + Link 2 Score + Link 3 Score ....

Since the analysis of all possible combinations between Salisbury and Belledune resulted in a total of 6,552 preliminary alternative routes being considered, PC computer limitations required a phased analysis in four parts:

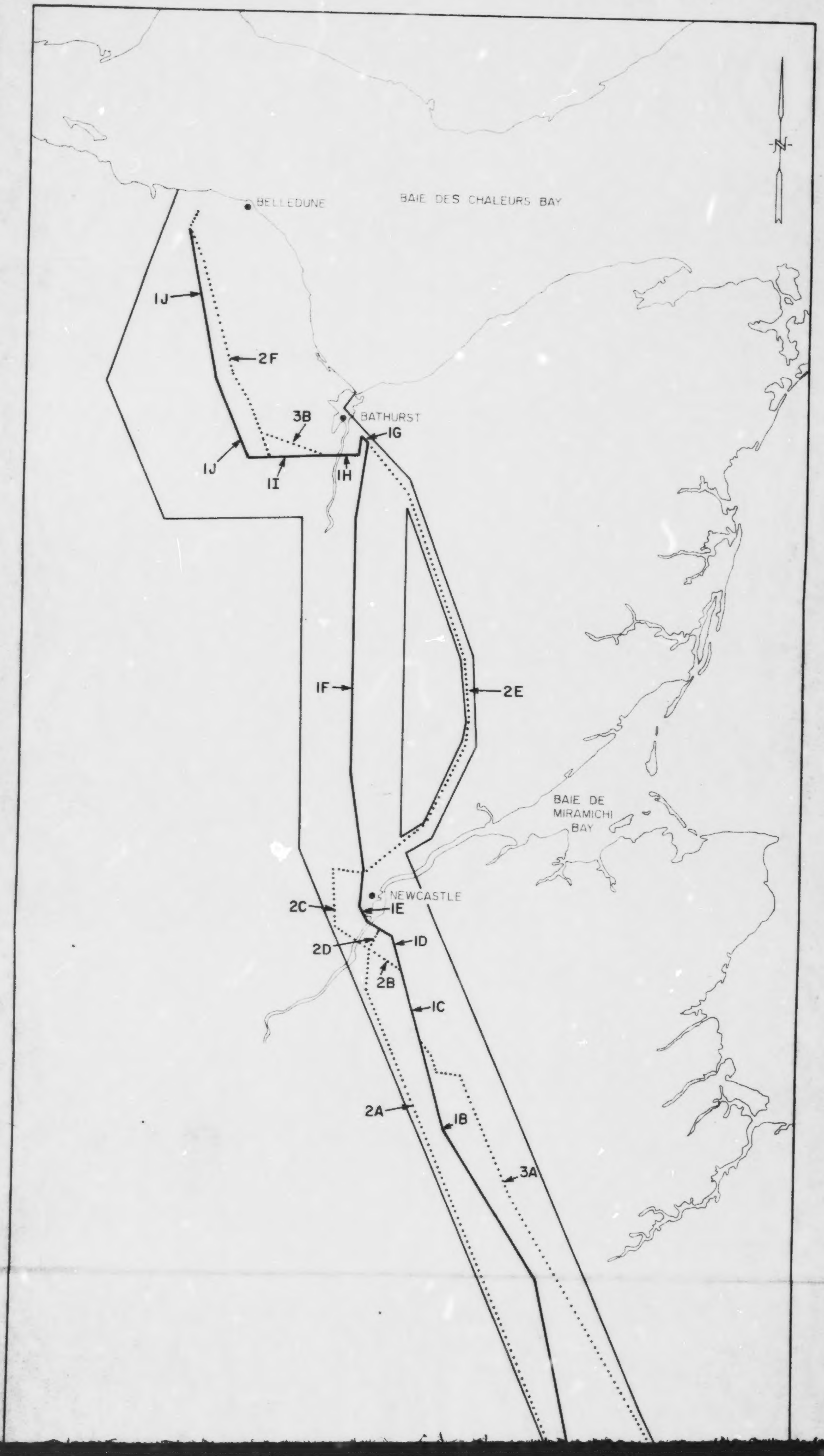
- Links 1 to 51;
- Salisbury to Newcastle using the preferred link 1 to 51 route;
- Newcastle to Bathurst; and
- Bathurst to Belledune.

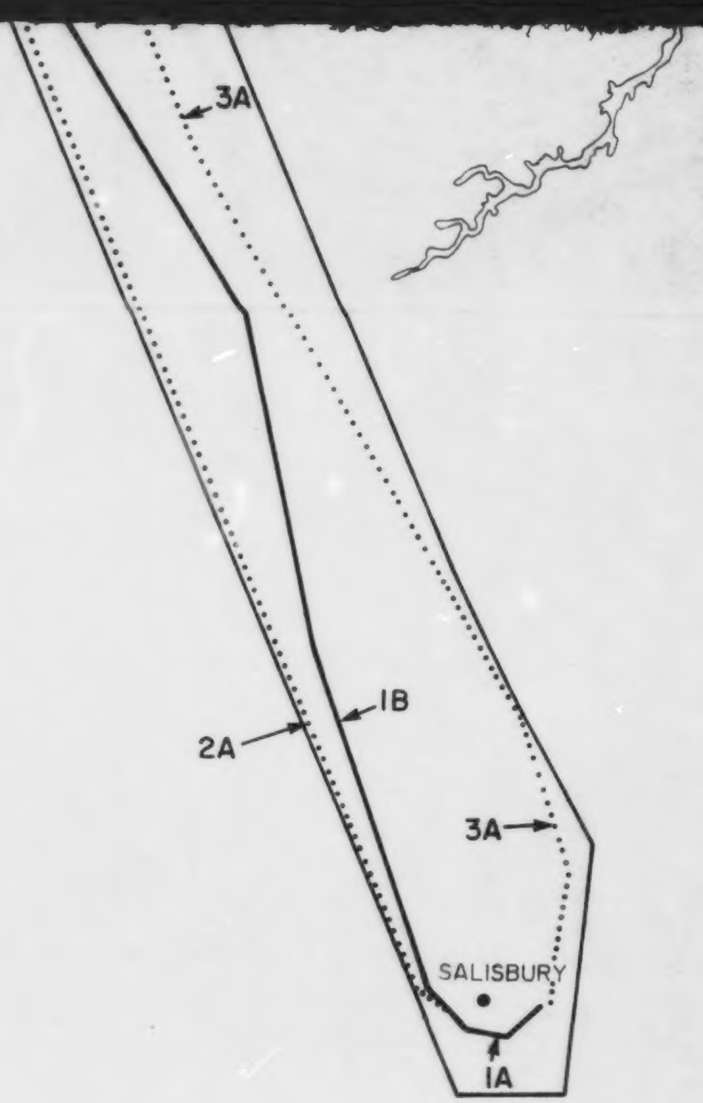
The first phase involved analysis of the large number of preliminary alternative routes coming out of the Salisbury terminal and going east, then north, resulting in a total of 39 possible routes between link 1 and link 51 (Table B-30; Map 1). It was necessary to select the lowest scoring route from these to act as an eastern alternative for the EIA. Although there were three routes equally with the lowest score, and thus all environmentally acceptable routes, Route 12 was chosen over the others because it exited the Salisbury terminal on the south, which, because of the terminal configurations, was the preferred exit point. Thus one of the lowest scoring routes between links 1 and 51 was used in subsequent analysis of routes to Newcastle; all the other links were dropped from consideration.

Subsequently, Salisbury to Newcastle was analyzed using PATHS, resulting in 33 potential routes (Table B-31). Finally, Newcastle to Bathurst and then Bathurst to Belledune were analyzed, resulting in two and three possible routes, respectively. Computer capabilities allowed full analysis of all preliminary alternative routes between Newcastle, Bathurst and Belledune.

B.3.7 Selection of the Proposed Route and Alternative Routes

Between Salisbury and Newcastle, six of the 33 potential routes were chosen as alternative routes (Figure B-12). These are the lowest scoring eastern, central and western routes, for each of two Miramichi River crossings; the lowest scoring route was the central route with the east crossing (Table B-31; Maps 1 to 5; Figure B-12). The lowest scoring of the two alternative routes between Newcastle and Bathurst follows the railway route and existing transmission line


N
BAIE DES CHALEURS BAY
BELLEDUNE
BATHURST
BAIE DE MIRAMICHI BAY
NEWCASTLE
1J
2F
3B
1J
1I
1H
1G
1F
2E
2C
1E
2D
1D
2B
1C
2A
1B
3A



PROPOSED ROUTE AND
ALTERNATIVE ROUTE SEGMENTS
SEGMENTS DU TRACÉ PROPOSÉ
ET DES TRACÉS ALTERNATIFS

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AMÉNAGISTES ET PROFESSIONNELS DE L'ENVIRONNEMENT

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PROJECT No.: TÂCHE No.: 2945	FIGURE No.: FIGURE No.: B-12

TABLE B-30: LINK 1 TO LINK 51 - PRELIMINARY ALTERNATIVE ROUTES

Route	**Length**	**Score**	**Path**	
12	**16.15**	**33.60**	**1 34 39 40 41 44 46 50 83**	**Proposed Route**
18	16.15	33.60	1 2 33 38 40 41 44 46 50 83	
23	16.15	33.60	1 34 35 38 40 41 44 46 50 83	
13	16.25	33.80	1 34 39 40 41 44 47 49 83	
19	16.25	33.80	1 2 33 38 40 41 44 47 49 83	
24	16.25	33.80	1 34 35 38 40 41 44 47 49 83	
26	16.25	33.80	1 34 39 40 41 44 46 48 49 83	
30	16.25	33.80	1 2 33 38 40 41 44 46 48 49 83	
34	16.25	33.80	1 34 35 38 40 41 44 46 48 49 83	
5	16.30	34.00	1 34 39 40 42 45 50 83	
9	16.30	34.00	1 2 33 38 40 42 45 50 83	
11	16.30	34.00	1 34 35 38 40 42 45 50 83	
27	16.35	34.00	1 34 39 40 42 43 44 46 50 83	
31	16.35	34.00	1 2 33 38 40 42 43 44 46 50 83	
35	16.35	34.00	1 34 35 38 40 42 43 44 46 50 83	
14	16.40	34.20	1 34 39 40 42 45 48 49 83	
20	16.40	34.20	1 2 33 38 40 42 45 48 49 83	
25	16.40	34.20	1 34 35 38 40 42 45 48 49 83	
28	16.45	34.20	1 34 39 40 42 43 44 47 49 83	
32	16.45	34.20	1 2 33 38 40 42 43 44 47 49 83	
36	16.45	34.20	1 34 35 38 40 42 43 44 47 49 83	
37	16.45	34.20	1 34 39 40 42 43 44 46 48 49 83	
38	16.45	34.20	1 2 33 38 40 42 43 44 46 48 49 83	
39	16.45	34.20	1 34 35 38 40 42 43 44 46 48 49 83	
3	16.80	34.60	1 2 33 36 37 45 50 83	
4	16.80	34.60	1 34 35 36 37 45 50 83	
16	16.85	34.60	1 2 33 36 37 43 44 46 50 83	
21	16.85	34.60	1 34 35 36 37 43 44 46 50 83	
8	16.90	34.80	1 2 33 36 37 45 48 49 83	
10	16.90	34.80	1 34 35 36 37 45 48 49 83	
17	16.95	34.80	1 2 33 36 37 43 44 47 49 83	
22	16.95	34.80	1 34 35 36 37 43 44 47 49 83	
29	16.95	34.80	1 2 33 36 37 43 44 46 48 49 83	
33	16.95	34.80	1 34 35 36 37 43 44 46 48 49 83	
1	18.20	36.65	1 2 32 37 45 50 83	
6	18.25	36.65	1 2 32 37 43 44 46 50 83	
2	18.30	36.85	1 2 32 37 45 48 49 83	
7	18.35	36.85	1 2 32 37 43 44 47 49 83	
15	18.35	36.85	1 2 32 37 43 44 46 48 49 83	

TABLE B-31: SALISBURY TO NEWCASTLE - PRELIMINARY ALTERNATIVE ROUTES, AND PROPOSED AND ALTERNATIVE ROUTES

	Route	Length	Score	Path	
C/E	**8**	**127.80**	**187.30**	**1 3 7 10 13 16 18 90 82 57 58 61 62 65 84**	**Proposed Route**
	16	128.55	187.85	1 3 7 10 11 12 14 16 18 90 82 57 58 61 62 65 84	
W/E	2	128.65	188.95	1 3 7 10 11 12 15 19 60 62 65 84	Alternative Route
	4	130.05	190.55	1 3 7 10 13 16 18 89 19 60 62 65 84	
	7	130.80	191.10	1 3 7 10 11 12 14 16 18 89 19 60 62 65 84	
	10	129.35	191.20	1 3 7 10 13 16 18 90 82 57 59 60 62 65 84	
	18	130.10	191.75	1 3 7 10 11 12 14 16 18 90 82 57 59 60 62 65 84	
	19	131.95	198.95	1 3 7 10 13 16 17 52 53 91 82 57 58 61 62 65 84	
	28	132.70	199.50	1 3 7 10 11 12 14 16 17 52 53 91 82 57 58 61 62 65 84	
	21	133.50	202.85	1 3 7 10 13 16 17 52 53 91 82 57 59 60 62 65 84	
	12	133.60	202.90	1 3 7 10 13 16 17 52 54 55 57 58 61 62 65 84	
	5	132.70	203.30	1 3 7 10 13 16 17 52 54 56 61 62 65 84	
	30	134.25	203.40	1 3 7 10 11 12 14 16 17 52 53 91 82 57 59 60 62 65 84	
	22	134.35	203.45	1 3 7 10 11 12 14 16 17 52 54 55 57 58 61 62 65 84	
	11	133.45	203.85	1 3 7 10 11 12 14 16 17 52 54 56 61 62 65 84	
W/W	1	135.35	204.10	1 3 7 10 11 12 15 19 20 21 22 84	
	3	136.75	205.70	1 3 7 10 13 16 18 89 19 20 21 22 84	
	6	137.50	206.25	1 3 7 10 11 12 14 16 18 89 19 20 21 22 84	
C/W	9	136.05	206.35	1 3 7 10 13 16 18 90 82 57 59 20 21 22 84	
	14	135.15	206.80	1 3 7 10 13 16 17 52 54 55 57 59 60 62 65 84	
	17	136.80	206.90	1 3 7 10 11 12 14 16 18 90 82 57 59 20 21 22 84	
	24	135.90	207.35	1 3 7 10 11 12 14 16 17 52 54 55 57 59 60 62 65 84	
E/E	31	125.50	213.35	1 34 39 40 41 44 46 50 51 52 53 91 82 57 58 61 62 65 84	
	33	127.05	217.25	1 34 39 40 41 44 46 50 51 52 53 91 82 57 59 60 62 65 84	
	25	127.15	217.30	1 34 39 40 41 44 46 50 51 52 54 55 57 58 61 62 65 84	
	15	126.25	217.70	1 34 39 40 41 44 46 50 51 52 54 56 61 62 65 84	
	20	140.20	218.00	1 3 7 10 13 16 17 52 53 91 82 57 59 20 21 22 84	
	29	140.95	218.55	1 3 7 10 11 12 14 16 17 52 53 91 82 57 59 20 21 22 84	
	27	128.70	221.20	1 34 39 40 41 44 46 50 51 52 54 55 57 59 60 62 65 84	
	13	141.85	221.95	1 3 7 10 13 16 17 52 54 55 57 59 20 21 22 84	
	23	142.60	222.50	1 3 7 10 11 12 14 16 17 52 54 55 57 59 20 21 22 84	
E/W	32	133.75	232.40	1 34 39 40 41 44 46 50 51 52 53 91 82 57 59 20 21 22 84	
	26	135.40	236.35	1 34 39 40 41 44 46 50 51 52 54 55 57 59 20 21 22 84	

Note:
C/E - Central Route/East Miramichi Crossing - Proposed Route
W/E - West Route/East Miramichi Crossing - Alternative Route
W/W - West Route/West Miramichi Crossing - Alternative Route
C/W - Central Route/West Miramichi Crossing - Alternative Route
E/E - East Route/East Miramichi Crossing - Alternative Route
E/W - East Route/West Miramichi Crossing - Alternative Route

(Table B-32; Maps 5 to 7; Figure B-12). Between Bathurst and Belledune the lowest scoring of three alternative routes was the west route (Table B-33; Maps 7 and 8; Figure B-12).

In all cases, the proposed route selected has been the lowest scoring route. This selection reflects the best possible combination of least length and least interaction with constraints of all alternatives. The Route Selection Study was conducted to identify an environmentally acceptable route which avoided constraints. Thus, all of the alternative routes identified are environmentally acceptable; the proposed route is the best of these. Some of the alternative routes scored higher because of greater length and varying amounts of higher scoring private land.

The proposed route is shown on Figure B-13 and Maps 1 to 8.

B.3.7.1 Salisbury to Newcastle

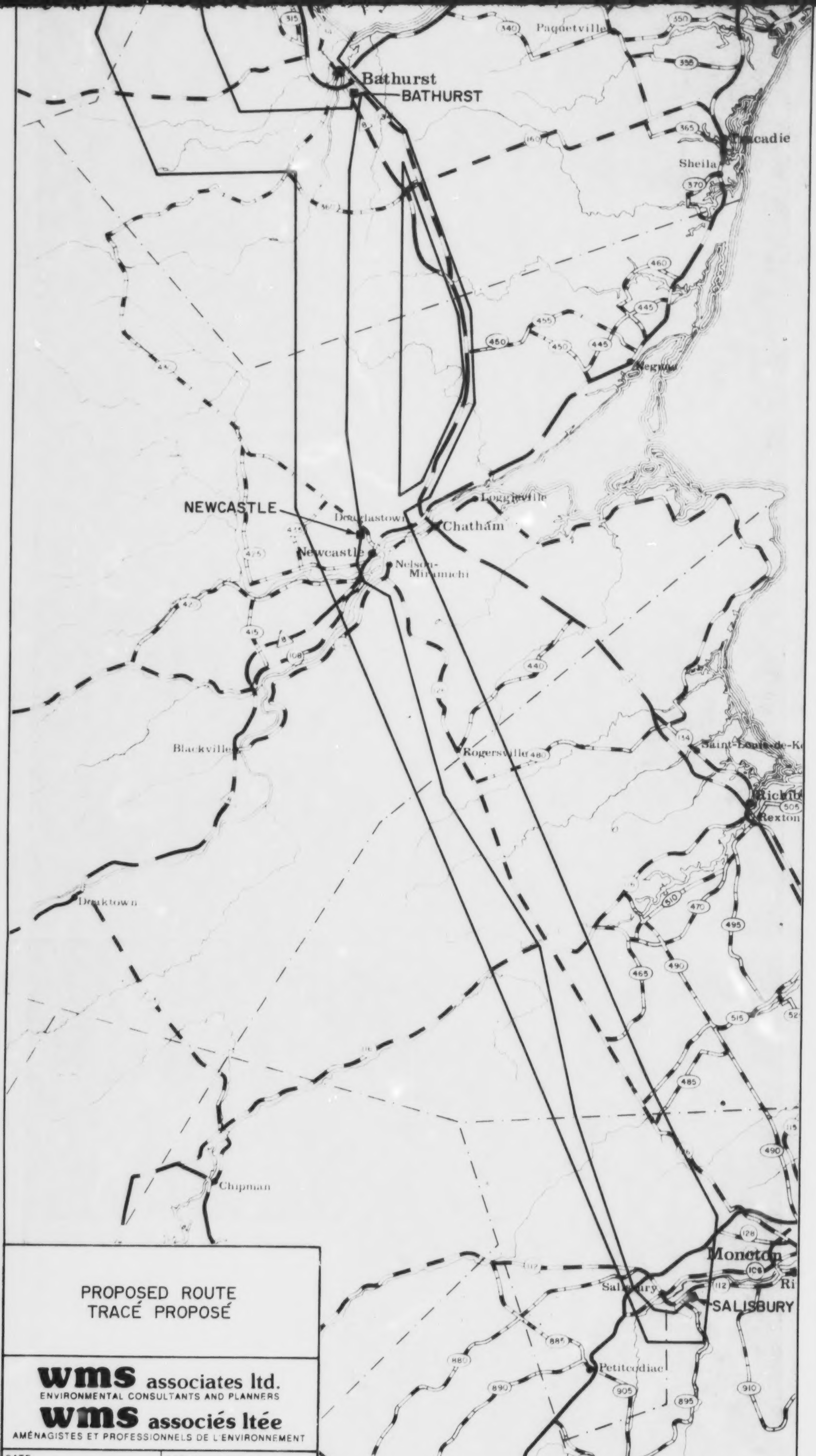
Table B-31 summarizes the six alternative routes between Salisbury and Newcastle. As outlined in Section B.3.4.2, the routes were picked to fall under three categories, depending on their location within the corridor, and their crossing of the Miramichi River west of Newcastle. In reality, these six options have some redundant portions and these six routes can be broken down into the Proposed Route Segments (Route 1) and Alternative Route Segments (Routes 2 and 3). These are identified as the proposed and alternative routes on Maps 1 to 5 and shown in Figure B-13. The proposed route corresponds to Route 8 in Table B-31. It is summarized here in terms of links and segments, but is described in detail in Chapters Four and Five. The proposed route consists of the following segments and links:

- Segment 1A (links 3, 7, 10)

  Southwest out of the Salisbury terminal along the south side of the existing transmission line #1151, and across Grub Road; northwest across Kay Settlement Road and Route 106.

- Segment 1B (links 13, 16, 18, 90)

  North across the Trans Canada Highway (Highway 2), west of Monteagle; west along the edge of a deer yard north of Monteagle; west of Jordan Meadow; across the CNR tracks and Canaan River between wetlands north of Canaan River; west of Birch Ridge Bog, passing well west of Coal Branch, Adamsville and


Paquetville
Bathurst
BATHURST
Caraquet
Sheila
Neguac
NEWCASTLE
Douglastown
Loggieville
Chatham
Newcastle
Nelson-Miramichi
Blackville
Rogersville
Saint-Louis-de-K
Richib
Rexton
Doaktown
Chipman
Moncton
Salisbury
SALISBURY
Ri
Petitcodiac
Rive
315
340
350
355
365
370
160
460
445
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445
430
425
420
415
8
108
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126
480
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PROPOSED ROUTE
TRACÉ PROPOSÉ

wms associates ltd.
ENVIRONMENTAL CONSULTANTS AND PLANNERS
wms associés ltée
AMÉNAGISTES ET PROFESSIONNELS DE L'ENVIRONNEMENT

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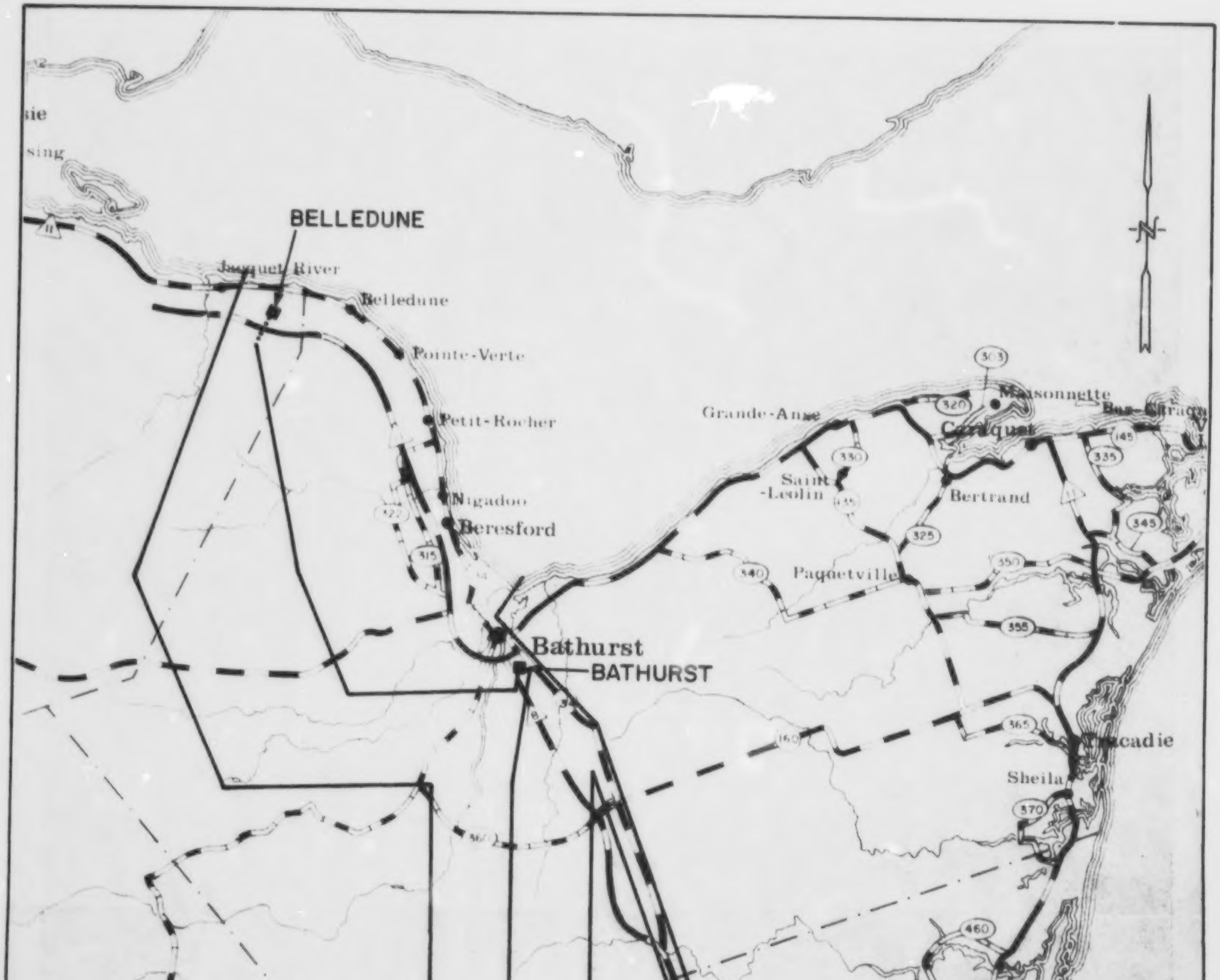
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TABLE B-32: NEWCASTLE TO BATHURST PROPOSED AND ALTERNATIVE ROUTES

Route	Length	Score	Path	
2	63.95	87.95	84 66 67 73 74 77 79 80	**Railway Route (Proposed Route)**
1	72.30	126.80	84 78 79 80	Highway 8 Route

TABLE B-33: BATHURST TO BELLEDUNE PROPOSED AND ALTERNATIVE ROUTES

Route	**Length**	**Score**	**Path**	
3	**55.40**	**83.45**	**80 92 94 98 99 100**	**West Route (Proposed Route)**
1	51.25	86.65	80 92 95 97 100	East Route with Cut off
2	53.10	87.65	80 92 94 96 97 100	East Route

Grangeville and slightly west of Harcourt and Mortimer (west of land grants); west of the grants at Kent Junction; west of a large deer yard north of Kent Junction, west of the grants at Noinville; northwest to avoid a wetland west of Noinville; north across narrow western portion of a bog having commercial potential; west of Rogersville across Pleasant Ridge Road; north across Young Ridge Road; west of North Rogersville; across West Collette Road; northwest to cross over narrow portions of wetlands; and across Right Hand Branch Barnaby River.

- Segment 1C (links 82, 57)

  Northwest across Crown and private land, Barnaby River and associated roads.

- Segment 1D (links 58, 61)

  Northwest across private land and CNR tracks to a point south of Nelson Junction.

- Segment 1E (links 62, 65)

  Northwest across Route 118, Southwest Miramichi River and Route 8 to Derby Junction; north across Route 420, Northwest Miramichi River and Route 425; along the west side of existing transmission line (#0076) to Jones Crossing; and north to the Newcastle Terminal Station at Cross Roads along the west side of the existing line (#0076).

The alternative routes are comprised of combinations of the Proposed Route Segments and the following Alternative Segments and links:

- Alternative Segment 2A (links 11, 12, 15, 19)

  Northwest from Segment 1A at the intersection of links 11 and 13 (Map 1), south of the CNR tracks; across the Trans Canada Highway (Route 2); turning north-northwest, across Routes 880 and 112, continuing in a generally straight path through mostly Crown land near the western boundary of the study corridor (Maps 1 to 4) and generally 1 to 6 km west of Segment 1B; passing the western edge of a plantation northwest of Monteagle; crossing the Canaan River, and the

CNR tracks east of North Branch, and the narrow portion of Selick Bog; passing west of St-Sosime; crossing the Salmon River (twice) and some private land in the vicinity of Route 116; bypassing a deer wintering areas at Route 116; crossing the Kouchibougacis River and some wetlands west of Acadie Siding; traversing a block of private land west of Rogersville, Pleasant Ridge, Young Ridge and West Collette; crossing Crown land in the vicinity of the Right Hand Branch Barnaby River; crossing private land at the Semiwagan Ridge Road; to a point east of Chelmsford, turning north-northeast, and passing near Kirkwood to the intersection of Segments 2B, 2C, and 2D (links 59, 20 and 60).

° Alternative Segment 2B (link 59)

Northwest from Segment 1C at the intersection of links 57 and 59 (Map 4), 1 km north of the Barnaby River; to a point 1 km southeast of the Southwest Miramichi River and Route 118, at the intersection of links 19 and 59.

° Alternative Segment 2C (links 20, 21, 22)

Northwest from Alternative Segment 2B, across Route 118 north of Kirkwood, the Southwest Miramichi River, Route 8 in Lower Derby, across private land, to a point immediately south of the DFO fish hatchery (Map 4); north, passing to the west of the hatchery, across Route 420, the Northwest Miramichi River, and Route 425 at Strathadam; to the west of the Eel Ground Indian Reserve (Maps 4 and 5); turning east just north of the Reserve and into the Newcastle Terminal Station.

° Alternative Segment 2D (link 60)

North-northeast from the intersection of Alternative Segments 2A and 2B (links 59 and 19; Map 4), across private land to the intersection of Segments 1D and 1E (links 61 and 62), parallel to and southeast of Route 118.

° Alternative Segment 3A (links 34, 39, 40, 41, 44, 46, 50, 51, 52, 53, 91, 82, 57)

Northeast out of the Salisbury Terminal Station, south of the existing transmission line corridor (Map 1); turning north 2 km southwest of Upper Coverdale, across the Petitcodiac River, through the communities of Boundary

Creek and Steeves Mountain, across the Trans Canada Highway (Route 2); continuing north generally along the eastern border of the study corridor, within an extensive area of private land; across CNR tracks and Route 128 to Catamount; turning North to parallel line #0010 at a point 2 km east of Gallagher Ridge; turning northwest paralleling Route 126 and Line #0010, and then crossing Route 126; by passing Bog 54 in Crown land; continuing northwest, paralleling Line #0010 on the west, 2 km east of Route 126; past the communities of Birch Ridge, Coal Branch, Adamsville, Grangeville, Harcourt and Mortimer (Map 2), Kent Junction and Rogersville (Map 3) through blocks of private and Crown land; north of Route 440 at Rogersville, turning west-northwest across Route 126 to Young Ridge (Map 4); turning northwest and passing west of North Rogersville and between Collette and West Collette; continuing west of a large bog on Crown land to intersect with Segment 1B at the Barnaby River, and the junction of links 90 and 91.

B.3.7.2 Newcastle to Bathurst

The analysis resulted in two routes between Newcastle and Bathurst:

- straight north from Newcastle along the railway corridor (the proposed route); and
- along Route 8.

These are shown in Figure B-13 and Maps 5 to 7.

The proposed route corresponds to Route 2 in Table B-32, and consists of the following segments and links:

- Segment 1F (links 66, 67, 73, 74, 77, 79)

  North from the Newcastle terminal at Cross Roads along the west side of the existing transmission line (#2131) to Patterson Siding; north through private land along the same line west of Telly Road Crossing; north along the corridor between the CNR tracks and the existing transmission line (#2131); past Busridge to Bartibog; north from Bartibog Station through mostly Crown land; north between the CNR tracks and transmission line #2131 to where the tracks veer off to the northwest through mostly Crown land; along the west side of line #2131 north to the existing line #1108 south of Route 8.

- Segment 1G (link 79)

  Northwest along the south side of line #1108 to the Bathurst Terminal Station.

The alternative route is comprised of Alternative Segment 2E in combination with Segment 1G. The Alternative Segment is described as follows:

- Alternative Segment 2E (link 78)

  Northeast then north and northwest along the west side of line #1106, west of and paralleling Route 8 to join Route 1F southeast of the Bathurst Terminal Station.

B.3.7.3 Bathurst to Belledune

Socioeconomic constraints in the immediate Bathurst area and in the area west and north of the City resulted in few connecting "windows" and a similarly small number of alternative routes. There are three alternative routes between Bathurst and Belledune (Table B-33; Maps 7 and 8; Figure B-12); Route 3 has been chosen as the proposed route.

The following segments and links comprise the proposed route:

- Segment 1H (link 92)

  South through private land from the Bathurst Terminal Station, east of Chamberlain Settlement to a point east of Gloucester Junction, then west to a point north of Blue Mountain Settlement, east of Route 430, at the junction of links 94 and 95.

- Segment 1I (link 94)

  West through private land from Blue Mountain Settlement, across Route 430, through Crown land to a point west of a road south of Rio Grande at the junction of links 96 and 98.

- Segment 1J (links 98, 99)

  West through mostly Crown land from a point south of Rio Grande at the junction of links 96 and 98; northwest through Crown then private land across the road west of South Tetagouche; across Tetagouche River; across Crown and private land west of Sormany, Nicholas-Denys and Free Grant (Map 7); and west of Big Meadow and across a complex of Crown land, wetlands and private land to the junction of links 99 and 97, and segment 2F at the transmission corridor containing lines 0025, 1115, and 2150 and 3008.

The two alternative routes are comprised of combinations of Segments 1H, 1I and Alternative Segments as described below.

- Alternative Segment 2F (link 96, 97)

  North-northwest from the intersection of Segment 1I and 1J (links 94 and 98), passing east of Rio Grande, through private land, across the Tetagouche River east of Tetagouche Falls Provincial Park, through Sormany and Nicholas-Denys and west of Free Grant (Map 7); continuing west of Dauversière through Crown land; turning northwest to intersect with Segment 1J and link 99 south of the existing transmission line corridor for lines 0025, 1115, 2150 and 3008 (Map 8).

- Alternative Segment 3B (link 95)

  West-northwest from the intersection of Segments 1H and 1I (links 92 and 94) northwest of Blue Mountain Settlement, across Crown and private land and the Middle River, intersecting Alternative Route Segment 2F north of Rio-Grande.

B.3.8 Comparative Evaluation of Alternative and Proposed Routes

B.3.8.1 Salisbury to Newcastle

The proposed route and five alternative route combinations between Salisbury and Newcastle were selected using the Route Selection Study and the objectives described in Section B.3.4.2, i.e., two crossings of the Miramichi River and an eastern, central and western alternative within the corridor.

As shown in Table B-31, the 33 routes are arranged in order of their constraint scores. Two of the lowest scoring routes were picked as alternative routes because they filled the routing criteria addressed in Section B.3.4.2. Both of these routes use the eastern Miramichi River crossing. Number 8, which scored 187.30, scored only slightly better than Number 2, at 188.95. However, Number 8 is a central route and Number 2 is a western route which is also 0.85 km longer. Although Number 8 is not the shortest route, it has the best environmental score, and thus the least interaction with constraints. A major factor in its favour is its closer distance to Route 126, and thus to access roads, compared to Number 2. Number 31, at 213.35, was a relatively high scoring route, but also the shortest; it was picked as the lowest scoring eastern route with the Eastern crossing of the Miramichi River. Number 31, however, passes through considerably more higher scoring private land, which increased its score. All the eastern routes scored generally higher because of the greater amount of higher scoring private land; of these, routes 15, 25, 31 and 33 were the four shortest routes.

The western Miramichi River crossings scored generally high (over 200). Number 1, at 204.10, was the lowest scoring western crossing route. Number 9 scored at 206.35, and Number 32 was the second highest scoring of the 33 routes, at 232.40. These routes scored higher because of more higher scoring private land and the added distance required to circumnavigate the Eel Ground Indian Reserve to the west before coming into the terminal at Newcastle.

There was only 10.55 km difference between the shortest and the longest of the six alternative routes. Number 8 was picked as the proposed route on the basis of the combination of relatively short distance, the lowest constraint score, and the most direct routing.

B.3.8.2 Newcastle to Bathurst

The wide discrepancy in scores between the two Newcastle to Bathurst routes made the choice of the most direct route obvious. It scored 87.95, versus the Route 8 route, which scored 126.80 (Table B-32). The proposed route was 8.35 km shorter and traversed more low scoring Crown land, which contributed to the difference in the scores. Route 8 is heavily settled with considerably more higher scoring private land along most of its length (Class 3). Furthermore, the proposed route is situated within a corridor containing a rail line and a transmission line; impacts will thus be focused within the existing corridor rather than the Route 8 residential/transportation corridor.

B.3.8.3 Bathurst to Belledune

Table B-33 summarizes the three Bathurst to Belledune routes. Number 3 exhibited the lowest score, and was chosen as the proposed route. It scored significantly lower than Numbers 1 and 2, despite the fact it was also the longest route. The proposed route's western position, west of most of the higher scoring private land and west of the more direct routes, contributed to its lower score and greater length.

APPENDIX C

GENERIC ENVIRONMENTAL PROTECTION PLAN (EPP) AND GENERAL OPERATION AND MAINTENANCE PROCEDURES

A GENERIC ENVIRONMENTAL PROTECTION PLAN

FOR THE CONSTRUCTION AND MAINTENANCE

OF TRANSMISSION LINES

IN NEW BRUNSWICK

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2.0 General

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- 2.2 Contractor's Responsibilities
- 2.3 Wildlife Protection
- 2.4 Storage and Handling of Fuels and Similar Materials
- 2.5 Waste Management
- 2.6 Marshalling Yards
- 2.7 Aircraft
- 2.8 Historical Resource Protection
- 2.9 Cleanup
- 2.10 Reclamation and Revegetation
- 2.11 Forest Fire Protection

3.0 Line Construction

- 3.1 Watercourse Crossings
- 3.2 Access to Site
- 3.3 Sensitive Terrain
- 3.4 Erosion Control
- 3.5 Clearing and Timber Salvage
- 3.5 Dewatering

4.0 Environmental Inspection

5.0 Line Maintenance

- 5.1 Ground Travel
- 5.2 Watercourse Crossings
- 5.3 Vegetation Control
- 5.4 General Protection

1.0 INTRODUCTION

The purpose of this environmental protection plan is to:

1. Minimize changes to the environment as a result of construction and maintenance practices

2. Inform the public and various regulatory bodies of NB Power activities

3. Provide guidelines for staff use during construction and maintenance activities

2.0 GENERAL

2.1. Owner's (NB Power) Policy

The Owner's Policy is to protect the environment and to minimize the environmental impact of construction and maintenance activities.

The owner wishes to ensure compliance with all government acts and regulations as well as maintain internal environmental practices and standards.

2.2. Contractor's Responsibilities

Contractors shall ensure that their employees and subcontractors comply with all applicable environmental laws, regulations, permits and requirements of federal, provincial and municipal authorities; and such other rules and regulations as the owner may establish.

Any contravention of environmental requirements, accidental or otherwise, resulting in environmental damage, shall be reported to the owner immediately. The contractor shall be responsible for cleanup, restoration and/or reclamation as may be directed by the owner, or provincial or federal authorities.

2.3 Wildlife Protection

No personnel shall harass or feed wildlife. There shall be minimal interference with designated wildlife areas.

The carrying of firearms, both on the jobsite, and in work vehicles, is prohibited.

2.4 Storage and Handling of Fuels and Similar Materials

(a) Contractors, subcontractors and their personnel shall take all necessary precautions to minimize the spillage, misplacement or loss of fuels and similar materials. Contractors shall ensure that these materials are handled only by personnel who are competent, and, that these materials are handled in accordance with manufacturer's instructions and government regulations.

(b) Fuel and lubricant storage systems must comply with New Brunswick environmental and safety regulations.

(c) Waste oils, lubricants and used filters shall be retained in a closed container and be disposed of as set forth in New Brunswick environmental regulations.

(d) Contractors and subcontractors shall have contingency plans that cover spills of fuel or similar materials.

(e) Contractors and subcontractors shall immediately notify the owner and New Brunswick Department of Municipal Affairs and Environment in the event of a spill of fuel or hazardous material. Every effort shall be made immediately to contain and clean up such a spill. Disposal of contaminated material from the site shall be accomplished as per environmental regulations and the methods employed must be appropriate and acceptable to the owner.

(f) Fueling, servicing and cleaning of mobile equipment will not be allowed within 30 metres of a water course. Crankcase and hydraulic oils must be captured in containers and not allowed to pollute soils or ground water.

(g) Storage tanks will be removed in a period of time specified by the owner. This must be accomplished respecting the New Brunswick Department of Municipal Affairs and Environment regulations.

(h) No pesticides or other toxic chemicals shall be used without prior approval of the owner. Use of these materials shall be regulated under the appropriate regulations.

2.5 Waste Management

(a) The contractor shall collect and dispose of all waste produced by its employees. Materials covered by environmental regulation shall be disposed of in waste disposal sites approved by the Minister of Municipal Affairs and Environment.

(b) Construction waste material shall be disposed of in waste disposal sites.

2.6 Marshalling Yards

(a) Equipment and material yards shall be located where there can be no watershed pollution. Contractors shall inform the owner of potential yard locations before occupying same.

(b) Abandoned gravel pits and commercial enterprises or previously disturbed areas shall be preferred locations, i.e. site should be of low value with respect to it's potential for other uses.

(c) Sites should be chosen which minimize potential traffic hazards.

2.7 Aircraft

(a) Aircraft used on line patrols shall avoid flying over:

1. Domestic Fur Farms
2. Nesting areas of any endangered species of birds, i.e. osprey, eagles, etc.

2.8 Historical Resource Protection

(a) Areas of geological or archaeological interest discovered on a jobsite shall not be disturbed. The owner shall be notified of such discoveries immediately before further disturbance occurs. Such sites are covered by the Historical Sites Protection Act (1978).

(b) In event of such a discovery, all work shall cease in the immediate area of the discovery.

2.9 Cleanup

(a) During the progress of the work, the contractor shall keep work areas in an orderly and presentable state. (New Brunswick Occupational Health and Safety Regulation).

(b) On completion of any portion of the work, a contractor shall remove all of it's construction plant and surplus material to an approved storage area. Upon completion of the work, and before final acceptance is issued, the Contractor shall dispose of or remove all construction plant, equipment, material and rubbish. Premises shall be left in a neat and clean condition.

2.10 Reclamation and Revegetation

(a) Upon completion of work, the owner shall reclaim or reduce the damage caused to disturbed areas. This includes leveling around structure locations and grading banked material along the sides of line construction roads.

(b) Revegetation shall be carried out in areas such as buffer zones and road crossings. Revegetation includes natural regeneration, tree planting and seeding of ground cover (grass, etc).

2.11 Forest Fire Protection

The contractor shall obtain the necessary work permits from the Department of Natural Resources and Energy, and will observe regulations as laid down in the New Brunswick Forest Fires Act.

3.0 Line Construction

3.1 Watercourse Crossings

Watercourses are defined as any running water having a width in excess of 0.5 meters during the summer low water period. (New Brunswick Crown Lands Act)

(a) watercourse buffer strips (vegetation) will remain after clearing as follows:

Slope of Bank	Min. Horizontal Strip Width from high water mark
0 to 5%	15 meters
6 to 10%	30 meters
Greater than 10%	60 meters

This rule for watercourse buffer strip width is intended primarily for smaller streams. Major streams, rivers and lakes may require wider strips. The following factors make wider strips desirable.

(a) unstable soils
(b) fish spawning and nursery areas
(c) aesthetics
(d) recreation use
(e) wildlife wintering areas or habitat needs

(b) No wheeled or tracked harvesting equipment shall be permitted to work within 10 meters of the edge of any watercourse and no harvesting will be permitted within a prescribed buffer zone.

(c) Vehicles shall not travel through streams or along stream bottoms. Whenever stream crossings are necessary, culverts shall be used and constructed as per regulations in the New Brunswick Crownlands Act.

(d) No tops, slash or debris from harvesting shall be allowed to enter any watercourse.

3.2 Access to Site

Access to construction sites includes logging roads, farm roads, etc. In case of rutting or damage, these roads will be returned to their original state upon completion of work.

3.3 Sensitive Terrain

(a) All bogs are considered sensitive terrain. Vehicular traffic on bogs shall be restricted to one track within the easement where possible.

3.4 Erosion Control

(a) Terrain disturbance and erosion resulting from construction activities shall be minimized. Control measures may include:

1. Spreading slash on disturbed areas

2. Installing baffles or sediment traps

3. Placing drainage collectors in disturbed areas to channel drainage into its natural course

4. Soil stabilization by placing riprap or planting vegetation.

3.5 Clearing and Timber Salvage

(A) Clearing for a transmission line and for any other areas as designated by the owner shall consist of cutting and piling of all trees, brush, fallen timber, etc., and the removal of salvaged timber.

(b) All material will be cut as close as possible to ground surface. Brush and branches will be broadcast and compacted to a maximum height of 1.5 feet.

(c) No slash shall be pushed or piled outside the easement. A ten foot buffer strip will be left along each edge of the easement. No material or debris shall be deposited in this area.

(d) The use of mechanical clearing methods such as bulldozers with blades will not be approved for clearing, however, the use of root rakes will be permitted.

(e) Trees outside the indicated clearing widths which may constitute a hazard to the safety of the proposed transmission line, as designated by the owner, shall be felled, slashed and removed in a manner approved by the owner.

3.6 Dewatering

(a) Water shall be pumped from pole or footing excavations into adjacent vegetated areas where it will be filtered prior to entering a watercourse.

4.0 Environmental Inspection

Compliance with the owner's Environmental Protection Plan is vested in the owner's employees and contractors. Inspections will be carried out on a continual basis by the owner throughout the duration of a project.

5.0 Line Maintenance

5.1 Ground Travel

Ground travel for line maintenance will generally follow routes established during construction. Where possible, travel should be minimized on improved areas, i.e. croplands, plantations, blueberry fields, etc.

5.2 Watercourse Crossings

Watercourse crossings used during construction will generally be utilized during maintenance activities.

5.3 Vegetation Control

(a) Vegetation will be controlled as per the owner's maintenance practices, by means of mechanical cutting, manual handcutting and the application of herbicides. These activities will be regulated by the New Brunswick Environmental Protection Act, the Occupational Health and Safety Act, and the Crown Lands Act.

5.4 General Protection

Relevant protection measures as detailed in Section 2 apply.

NEW BRUNSWICK POWER
ÉNERGIE NOUVEAU-BRUNSWICK

THE NEW BRUNSWICK ELECTRIC POWER COMMISSION
GENERAL OPERATION & MAINTENANCE PROCEDURES
PLANT OPERATIONS DIVISION

SUBJECT Spills of Hazardous Materials			O & M NO. 42 PAGE 1 OF 3
PREPARED BY Chris Doiron	APPROVED BY Dept. Head	APPROVED BY Mgr. Plant Operations	SUPERCEDES: 88-01-08 DATED: 89-05-30
DIST. OF COPIES			

PURPOSE

The purpose of this procedure is to outline the Commission's requirements for containing, reporting and cleaning up accidental releases of oil or other environmentally hazardous material.

PROCEDURE

I. GENERAL

This procedure is to be applied to the handling of spills involving:

1. sulfuric acid stored in bulk (battery rooms are included in this category),
2. caustic soda stored in bulk,
3. fuel oils,
4. lubricating oils,
5. turbine governing fluids,
6. any other material whose regulatory status is unclear or unknown.

Note: Spills involving PCB - contaminated material are to be handled in accordance with O & M No. 23.

II. SPILL REPORTING AND CLEAN-UP

1. All practical precautions are to be taken to prevent the release of hazardous materials to the environment.

2. Reporting

   (i) Spills which occur outside the confines of Commission-owned property:

   All such incidents, regardless of volume or location, are to be reported immediately by the Operations Superintendent or his designate to:

(4660)

- The Distribution Operating Centre at 1-800-442-9750, who in turn will notify a member of the Commission's Central Technical Services (CTS) Division.

- During normal working hours, the local office of The Department of Municipal Affairs and Environment (MA & E) (contacts are shown on Exhibit I); outside of normal working hours, and Halifax office of the Canadian Coast Guard at 1 (800) 565-1633. This latter number is simply a 24 hour service which ensures that MA & E's on-call inspector is notified as soon as reasonably possible. In either case, state the reason for the call, the nature of the spill, site location and the estimated quantity involved if available.

(ii) Spills which are confined to Commission-owned property:

- If the spill volume is greater than 50 liters, proceed as in (i).

- If the spill volume is less than 50 liters, notify the Operations Superintendent or his designate and proceed to step 2 (iv).

(iii) If the status of any spill is unclear proceed as in (i) above.

(iv) Upon completion of the clean-up, a Form 590 (copy attached) should be forwarded to Central Technical Services, H.O. 4E.

3. Clean-Up

Both the degree and urgency of the clean-up effort vary widely with specific circumstances, e.g. the location and volume of the spill and the time of day the incident occurs. However, it is the responsibility of the Operations Superintendent or his designate to ensure that:

(i) The recovery of all contaminated material is undertaken as soon as practically possible.

(ii) All cleaning cloths, absorbents, etc. utilized in the clean-up are included with the waste.

(iii) All waste materials are held on Commission property until such time as a decision on final disposal has been agreed to by M.A. & E.

4. General

A single individual should be designated within each station to handle public inquiries related to such incidents, and the role of this individual should be communicated to all personnel who might be involved in spill response.

III. SAFETY AT THE SPILL SITE

1. All non-essential people are to be cleared from the area and traffic diverted where possible; this may require barricades. The affected area should remain cordoned off until such time as the clean-up has been completed.

2. Ignition sources must be eliminated until such time as it has been shown that no fire hazard exists.

3. If clean-up operations should necessitate entry into a confined space or vessel, no entry shall be made until the requirements of Provincial O.S.A.R. Section 10(3) are complied with.

4. Prolonged exposure to vapour emanating from the spill is to be avoided. The use of self-contained breathing apparatus should be considered in situations where a spill has occurred in an enclosed and/or poorly ventilated area.

5. If a spilled chemical is in containers or packages, the procedure should be to first remove the undamaged containers and then deal with the damaged ones.

6. Hard hats and safety glasses are to be worn by all members of the clean-up crew.

7. Direct skin contact with the spilled material is to be avoided.

    (i) Plastic-coated cotton or rubber gloves (not linemen's gloves) shall be worn at all times when performing clean-up work that requires direct hand contact. Smoking, eating and/or drinking are prohibited during the performance of such work.

    (ii) Protective clothing (i.e. rubber boots and rain gear) shall be worn at all times if it appears that clean-up work could result in direct contact with an individual's personal clothing or footwear. Such contact is generally restricted to the clean-up of major spill situations.

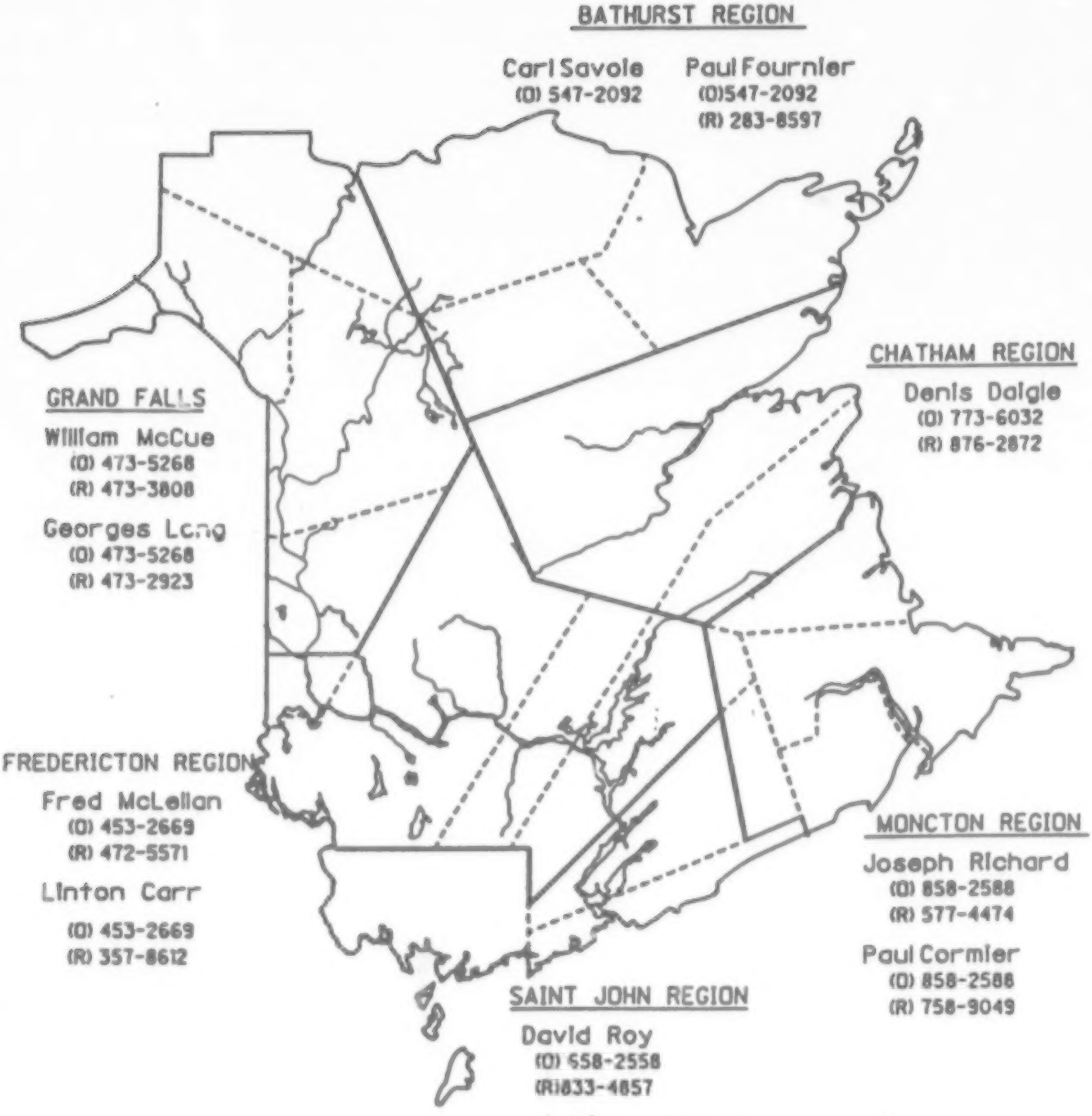
    (iii) When work is completed and/or before smoking, eating or drinking, hands should be thoroughly washed with a mild soap and water. If water is not available (as is often the case in field situations) the use of a cream type, organic hand cleaner and clean rags is an acceptable alternative.

8. In cases where direct skin and/or eye contact with a spilled material does occur, wash the affected area thoroughly with large volumes of clear water. If contact has been severe a physician should be consulted immediately.

9. All other safety precautions which would normally apply (e.g. grounding of equipment, obtaining necessary work permits) apply in spill clean-up situations. More specific definition of such requirements is beyond the scope of this procedure.

EXHIBIT I

ENVIRONMENTAL INSPECTORS BY ZONE


BATHURST REGION
Carl Savole
(O) 547-2092
Paul Fournier
(O)547-2092
(R) 283-8597
CHATHAM REGION
Denis Daigle
(O) 773-6032
(R) 876-2872
GRAND FALLS
William McCue
(O) 473-5268
(R) 473-3808
Georges Long
(O) 473-5268
(R) 473-2923
FREDERICTON REGION
Fred McLellan
(O) 453-2669
(R) 472-5571
Linton Carr
(O) 453-2669
(R) 357-8612
MONCTON REGION
Joseph Richard
(O) 858-2588
(R) 577-4474
Paul Cormier
(O) 858-2588
(R) 758-9049
SAINT JOHN REGION
David Roy
(O) 658-2558
(R)833-4857

Colleen Mullin

ORM NO. 590 REV.12/79

THE NEW BRUNSWICK ELECTRIC POWER COMMISSION

DATE: ____________

ENVIRONMENTAL CONTINGENCY REPORT

REPORT NO.# ____________

ENERGY CONTROL
NOTIFIED AT: ____________

STATUS OF REPORT
- INTERIM - [ ]
- FINAL - [ ]

DATE & TIME -
CAPABILITY LOST: ____________ CAPABILITY RESTORED: ____________

MAJOR POLLUTANT: ____________

ESTIMATED QUANTITY: ____________

LOCATION OF INCIDENT: ____________

ENVIRONMENTAL IMPACT: ____________

CAUSE: ____________

SAMPLING DONE: ____________

RESULTS OF ANALYSIS: ____________

CONCLUSIONS AND RECOMMENDATIONS: ____________

(SEE SEQUENCE OF EVENTS ON REVERSE)

PREPARED BY: ____________
ENVIRONMENTAL CO-ORDINATOR

CIRCULATE TO: ____________ ____________ ENVIRONMENTAL CONTROL FILE
____________ ____________ ENVIRONMENT N.B.
____________ ____________ ENVIRONMENT CANADA

RM NO.590-2 REV.12/79

ENVIRONMENTAL CONTINGENCY REPORT

INCIDENT: ______________________ REPORT NO. # ______

POLLUTANT: ______________________

Page 2

SEQUENCE OF EVENTS RECORD

DATE & TIME	DESCRIPTION OF ACTION TAKEN

STAFF INVOLVED	INITIALS

COMMENTS: ______________________

APPENDIX D
RECREATIONAL LAND USE

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D.1 Agencies Contacted

D.1.1 Recreational Directors

Municipal and Regional Recreation Directors	Study Corridor Section Used
Department of Tourism, Recreation and Heritage, Recreation Director Miramichi/Kent René Pelletier	Salisbury to Newcastle Newcastle to Bathurst
Department of Tourism, Recreation and Heritage, Recreation Director Chaleur Réal Savoie	Newcastle to Bathurst Bathurst to Belledune
Moncton Recreation Department Ian Fowler	Salisbury to Newcastle
Pleasant Ridge Recreational Council Euclide Bourque	Salisbury to Newcastle
Derby Parish Recreational Council David Saunders	Newcastle to Bathurst
Harcourt Recreational Council Iva Agnew	Salisbury to Newcastle
Bathurst Recreational Department Shelley Carter-Rose	
Nelson-Miramichi Recreational Commission David Malley	Salisbury to Newcastle
Newcastle Recreational John Copp	Salisbury to Newcastle Newcastle to Bathurst
Village of Belledune Don McAllister, Administrator	Bathurst to Belledune
Village of Petit-Rocher Gilles Bryar	Bathurst to Belledune

D.1.2 Recreational Organizations

Recreational Association	Study Corridor Section Used
Snow White Snowmobile Trek Conrad Landry, Active Participant Mrs. Edvard Landry	Salisbury to Newcastle

Canoe New Brunswick Guy Roach, Active Member	Newcastle to Bathurst Bathurst to Belledune
Miramichi Snowmobiling Club Gerald McGraw, Vice President	Newcastle to Bathurst
Miramichi Valley Fish and Game Association Steve Allen, Director	Salisbury to Newcastle Newcastle to Bathurst
Cross Country Ski Club of Petit-Rocher Carol Tremblay, Past President	Bathurst to Belledune
Northumberland Salmon Protection Association Vernon Goodfellow	Salisbury to Newcastle Newcastle to Bathurst
Rough Water Cross Country Ski Club Rod Vienneau	Bathurst to Belledune
Miramichi Cross Country Ski Association Vernon Goodfellow, Publicity Manager	Salisbury to Newcastle Newcastle to Bathurst
University of Moncton Alphonse Caissie, Professor	Salisbury to Newcastle Newcastle to Bathurst Bathurst to Belledune

D.1.3 Department of Natural Resources and Energy - Regional Offices

People Contacted	**Study Corridor Section Used**
Biologist, Newcastle Bernard Dubé	Salisbury to Newcastle Newcastle to Bathurst
Regional Wildlife Biologist Region 2, Newcastle R. Currie	Salisbury to Newcastle Newcastle to Bathurst
District Ranger, Newcastle Roy Babin	Salisbury to Newcastle Newcastle to Bathurst
District Ranger, Petitcodiac Allan Goddard	Salisbury to Newcastle
District Ranger, Rogersville André Goguen	Salisbury to Newcastle
District Ranger, Bathurst Jack Furlotte	Newcastle to Bathurst Bathurst to Belledune
District Ranger, Nash Creek Paul Tatlock	Bathurst to Belledune

District Ranger, Harcourt James Mundle	Salisbury to Newcastle
District Ranger, Allardville Edward Legacé	Newcastle to Bathurst
Regional Wildlife Biologist Region 3, Hampton Tom Pettigrew	Salisbury to Newcastle
Regional Wildlife Biologist Region 1, Bathurst Gilles Godin	Newcastle to Bathurst Bathurst to Belledune
Biologist, Campbellton Al Madden	Bathurst to Belledune

D.2 Surveys

Recreation surveys are provided on the following pages.

RECREATION SURVEY - RECREATIONAL COUNCILS/TOURISM

Good morning/afternoon/evening. This is ______________ from WMS Associates Ltd. in Fredericton. We are a private consulting firm completing a study on the recreational use of the land in your area. Specifically, a strip of land approximately 15 km wide which stretches from the village of Salisbury in the south through Newcastle to Bathurst and north to Belledune. Our client, NB Power, is currently proposing that a transmission line be located **within** the 15 km study corridor. This study corridor is approximately 149 miles in length. Of course, the transmission line right-of-way would only be 50 m or approximately 150 feet in width. Would you have a few minutes to answer some general questions on the types and relative amount of recreational use of this study corridor?

Is the location of 15 km wide corridor clear?
Provide additional detail as required: It may be helpful to have some local reference points "close to" the club's "home base"; i.e., corridor includes Village of Rogersville, Tilley Road, transmission line which runs along Route 126, etc.

____

____

____

____

1. First of all, what outdoor recreational activities are popular in your area?

   Cross Country Skiing_____; Camping_______;Snowmobiling ______;
   Canoeing ______; Hunting ______; Fishing _______;
   Wildfood Harvesting _____; Small game trapping (recreational only) ____
   Other ___________

2. How many people or what percentage of the people who reside in the area participate in these activities? An estimate or approximate is fine - we are just trying to get a "general feel" for the relative popularity of one activity in comparison to other outdoor activities (i.e. hunting and fishing less popular than cross-country skiing or camping or snowmobiling)

   ____

   ____

   ____

3. What areas of the study corridor are used by residents who participate in these outdoor activities? Does this include the use of transmission lines? If transmission lines are used, which ones?

Cross-country
skiing:____
Camping____
Snowmobiling______________________________Hunting______
______________________________Fishing______________
________________________Canoeing__________________
____
Wildfood Harvesting
____
Other____

4. Are you aware of any clubs who would also be using any portions of this area? If so, what club __________?

Would you have a general knowledge of this club's activity? _______ If yes, would the areas used/level of use be generally the same as for the local residents? If areas/level of use differ, obtain detail

____
____
____
____

If not aware of use, do you have contact name/phone/address for this group/club?

____
____

5. A proposed transmission line route has also been selected by NB Power. As mentioned, this proposed transmission line right-of-way is only 150 feet wide. It would originate at the Salisbury Terminal near Salisbury, N.B. and proceed northerly bypassing the village of Salisbury to the west and to the west of Route 126 to Barnaby River, then across the southwest and northwest Miramichi Rivers west of Newcastle and connect with the Newcastle Terminal on the Chaplin Island Road. It then proceeds north from Newcastle to the Bathurst Terminal along the CNR rail line. From Bathurst the corridor proceeds southwest, skirting the city then north and to the west of Route 11 into Belledune.

Should the proposed route be approved by the New Brunswick Department of the Environment, do you feel that local residents would benefit (from the recreational use aspect) from the existence of a new transmission line right-of- way? ________

Specifically, do you feel this route would be used by residents as much as or less than current use of existing transmission line right-of-ways?

________Why?____

____

Would the Department of Tourism/Recreational Council or residents have any concerns about the location of this transmission line right-of-way which you would like included in the report submitted to the New Brunswick Department of the Environment. If yes, details:

____

____

6. If residents do use a transmission line right-of-way, are you aware of any problems in the past with landowners from their using this area? ______If yes, how often and what types of problems?

____

____

____

That is the last of our/my questions. I would like to thank you for your time in answering these questions. You have been most helpful - the information you have provided will be included in the report we submit to the client and to the Department of the Environment. Just to check, your position in the Department of Tourism/Recreational Council is President/Secretary/etc.? ________________. Once again, thank you very much. Conclude the interview.

RECREATION SURVEY - ORGANIZATIONS

Good morning/afternoon/evening. This is ______________ from WMS Associates Ltd. in Fredericton. We are a private consulting firm completing a study on the recreational use of the land in your area. Specifically, a strip of land approximately 15 km wide which stretches from the village of Salisbury in the south through Newcastle to Bathurst and north to Belledune. Our client, NB Power, is currently proposing that a transmission line be located **within** the 15 km study corridor. Of course, the transmission line right-of-way would only be 50 m or approximately 150 feet in width. This study corridor is approximately 149 miles in length. Would you have a few minutes to answer some general questions on whether or not your club/organization, the ________________, uses this land for recreational purposes?

Is the location of 15 km wide corridor clear?
Provide additional detail as required: It may be helpful to have some local reference points "close to" the club's "home base"; i.e., corridor includes Village of Rogersville, Tilley Road, transmission line which runs along Route 126, etc.

____

____

____

____

1. First of all, does your club/group use any portion of this area?
   Where____

   ____

   ________________________How often and how many people (try to get them as specific as possible, i.e., about 20 people, once a week during the winter)

   ____

   ____

   How many people are in your club:________________________

2. As noted/not noted above, your club currently uses/does not use existing transmission lines? If transmission lines are used, which ones

   ____

3. Are you aware of any other clubs/local residents who would also be using any portions of this area for __________? If so, who _________?

Would you have a general knowledge of this club's or local residents activity? ______

If yes, would the areas used/level of use be generally the same as for your group and how many people are in this group? If areas differ, obtain detail

____

____

____

____

If not aware of use, do you have contact name/phone/address for this group?

____

____

4. Do you know of any other recreational activities which are conducted in this area and are any of these activities generally popular?

Canoeing ___Popular___;Area________________________

Cross-Country skiing____ Popular___; Area ________________

Fishing_____Popular ___; Area:______________________

Hunting____ Popular ___; Area: _____________________

Camping ___ Popular ____; Area:_____________________

Wild Food harvesting: fiddleheads____; strawberries _____; blueberries _____;

trapping small game _____; Popular ones: ________; Areas:

____

____

Others (specify)___________________________.

Would you have just a general idea on the number or percentage of people in your village/parish who participate (for popular activities)?_______________

5. A proposed route has also been selected by NB Power. The proposed transmission line right-of-way would originate at the Salisbury Terminal near Salisbury, N.B. and proceed northerly bypassing the village of Salisbury to the west and to the west of Route 126 to Barnaby River, then across the southwest and northwest Miramichi Rivers west of Newcastle and connect with the Newcastle Terminal on the Chaplin Island Road. It then proceeds north from Newcastle to the Bathurst Terminal along the CNR rail line. From Bathurst the corridor proceeds southwest, skirting the city then north and to the west of Route 11 into Belledune.

From the above your club/organization does/does not currently use this area. Should the proposed route be approved by the New Brunswick Department of the Environment, do you feel that your club would benefit from the existence of a new transmission line right-of- way? ________ Specifically, do you feel this route would be used by your club as much as or less than current use of existing transmission line right-of-ways?

________Why?____

____

Would your club have any concerns about the location of this transmission line right-of-way which you would like included in the report submitted to the New Brunswick Department of the Environment. If yes, details:

____

____

6. If you use a transmission line right-of-way, have you had any problems in the past with landowners from your using this area? ______If yes, how often and what types of problems?

____

____

____

To avoid this type of problem, does your group request permission from private landowners to use this transmission right-of-way? _____

That is the last of our/my questions. I would like to thank you for your time in answering these questions. You have been most helpful - the information you have provided will be included in the report we submit to the client and to the Department of the Environment. Just to check, your position in the club is President/Secretary/etc.? ________________. Once again, thank you very much. Conclude the interview.

HUNTING/FISHING/TRAPPING SURVEY

Good morning/afternoon/evening. This is _______________ from WMS Associates Ltd. in Fredericton. We are a private consulting firm completing an Environmental Impact Assessment study on the recreational use of a 15 km wide strip of land in the region. Our client, NB Power, is proposing that a transmission line be built which stretches from the village of Salisbury in the south through to Newcastle; from Newcastle to Bathurst and north to Belledune. Our client, NB Power, is currently proposing that a transmission line be located **within** the 15 km study corridor. This study corridor is approximately 149 miles in length. Of course, the transmission line right-of-way would only be 50 m or approximately 150 feet in width. Would you have a few minutes to answer some general questions on the level of fishing/hunting/trapping activity which occurs in this area?

Is the location of 15 km wide corridor clear?
Provide additional detail as required: It may be helpful to have some local reference points "close to" the club's "home base"; i.e., corridor includes Village of Rogersville, Tilley Road, transmission line which runs along Route 126, etc.

1. We would like to have just a general idea on amount of fishing in streams in the study corridor:

   We have the drainage systems and major rivers in your region which are in the study corridor. We would like to have your opinion of the level of use, when it's used, by whom, etc.

River	Level of use	When	By Whom

Activity adjectives (moderate, fair, light, heavy)
Is most of this activity local_____,other regions________, non-residents_______

2. If non-residents are using these rivers, are any of the appropriate rivers designated (that is a guide is required)?

3. What would the likely impact/affect on these rivers be should the transmission line be approved?

4. Are any of the rivers scheduled (as fly fishing only); if so, which ones and what are the applicable seasons?

5. Are there any Crown Reserve Waters?

6. Are there any angling leases on any of the rivers?

7. Are there any fish management programs in place by DNRE/DFO?
If so, which ones (name, history, roles and who does what)

Would the building of the proposed transmission line would affect this management program? If so, in what way?

____

____

____

8. Are there any camps within the study corridor where owners/lessees use the area for fishing/hunting? If yes, where

____

Is this a Crown campsite lease_______If so, name of lessee?____________________

9. Are any of these camps used by licensed outfitters? ____ If so, how active in the area? If so, who and where and is this fishing/hunting? What about unlicensed outfitting - what is the level of activity?

____

____

____

____

Are there any hunting guides in your region who use the study corridor (if not known, obtain contact name of person who should know)_____________

10. Are there any trappers active in the area? If so:
How many have been issued trapping licences _____
What animals do they trap ____________________
Is this a full-time or part-time occupation ____________
What would the average value of trapping be ____________
Are you aware of regions which are trapped

____

____

11. Are there any DFO offices in the area who are also responsible for the management and protection of the fishing resource? If so, where ____________________________
Would a DFO representative have any further knowledge about management programs and protection other than what we have discussed? If so, who

____

12. Are there local fishing/hunting/trapping associations or others who would have specific knowledge about a brook/stream/hunting or trapping area that we should speak with?

____

____

13. For regional biologists, what District Offices should we contact to obtain a more local feel for the level of activity, etc.

Name and Phone #:______________________________
Name and Phone #:______________________________

CAMPGROUND SURVEY

Good morning/afternoon/evening. This is ________________ from WMS Associates Ltd. in Fredericton. We're a private consulting firm completing a study on campgrounds within a strip of land approximately 15 kilometres wide which stretches from the Village of Salisbury in the south, through Newcastle to Bathurst and north the Belledune. Our client, NB Power, is currently proposing that a transmission line be located within the 15 km study corridor. Of course, the transmission line right-of-way would only be 50 m or approximately 150 feet in length. This study corridor is approximately 149 miles in length. Would you have a few minutes to answer a few questions on the use of your campground?

1. The name of your campground is ______________________

2. Are you the operator as well as the owner _______?

3. Your campground is located ____
____

4. Who uses your campgrounds: tourists ________?; local residents ________?; organizations/clubs ________?

5. During the summer how many of your sites are used during weekends _____; during week days ____?

6. During the spring/fall season, what is the campground used for: fishing _______?;
hunting _______?;
camping _______?; other ________________________?

That is the last of our/my questions. I would like to thank you for your time in answering these questions. You have been most helpful - the information you have provided will be included in the report we submit to the client and the Department of Environment. Once again, thank you very much.

APPENDIX E
COMMERCIAL LAND USE

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E.1 Agencies Contacted

E.1.1 Department of Natural Resources and Energy - Regional Offices

R. Currie, Regional Wildlife Biologist, Region 2, Newcastle

Roy Babin, District Ranger, Newcastle

Allan Goddard, District Ranger, Petitcodiac

André Goguen, District Ranger, Rogersville

Jack Furlotte, District Ranger, Bathurst

Paul Tatlock, District Ranger, Nash Creek

James Murdle, District Ranger, Harcourt

Edward Legacé, District Ranger, Allardville

Gilles Godin, Regional Wildlife Biologist, Region 1, Bathurst

Al Madden, Biologist, Campbellton

E.1.2 Outfitters

Jim Mills, Owner/Operator, Salmon River Lodge, Chipman

Joan Gray, Co-owner, Nepisiguit River Camps, Bathurst

Eugene Gillis, Owner, Old Mill Boat & Gun Club, Red Bank

Scott Campbell, Operator, Northwest Miramichi Lodge, Douglastown

Wilfred Ward, Owner, Broken Feather Lodge, Red Bank

Percy Smith, Owner, Highbridge Camps, Newcastle

E.2 Surveys

The survey used to collect information of trapping is provided in Section D.2. The outfitter's survey is provided on the following pages.

OUTFITTING SURVEY

Good morning/afternoon/evening. This is _______________ from WMS Associates Ltd. in Fredericton. We are a private consulting firm completing a study on the recreational and commercial use of the land in your area. Specifically, a strip of land approximately 15 km wide which stretches from the village of Salisbury in the south through Newcastle to Bathurst and north to Belledune. Our client, NB Power, is currently proposing that a transmission line be located within the 15 km study corridor. This study corridor is approximately 149 miles in length. Of course, the transmission line right-of-way would only be 50 m or approximately 150 feet in width. Would you have a few minutes to answer some general questions on whether or not your business uses this land for outfitting purposes?

Is the location of 15 km wide corridor clear?
Provide additional detail as required: It may be helpful to have some local reference points "close to" the club's "home base"; i.e., corridor includes Village of Rogersville, Tilley Road, transmission line which runs along Route 126, etc.

____
____
____
____

Members of the study team have held public information sessions to receive information on the concerns any resident or business may have in relation to the proposed transmission line. What I would like to do this morning/afternoon is to obtain more detailed information from you on your level of use of the area, etc..

1. First of all, does your outfitting business use any portion of this area?
Where____
____
____

If no use of the area: Move to question 6.

2. What percentage of your clientele is non-resident? ____ Could you estimate the number from NB, rest of Canada, US, off-shore?
NB______; Rest of Canada _____; US ______; off-shore ______.

3. What are the species your clients hunt or fish in the area?
deer _____; bear _____; moose _____; upland game _____
salmon _____; trout _____; bass _____; other _____

4. When do you use the area (i.e., from beginning of April to end of June)?
____
____
____

5. Could you estimate the percentage of your business which comes from using this area?
__________ Would it be possible for you to shift your activities temporarily?
____

6. A proposed route for the transmission line has also been selected by NB Power. As mentioned previously, the proposed transmission line right-of-way is only 150 feet wide. It would originate at the Salisbury Terminal near Salisbury, N.B. and proceed northerly bypassing the village of Salisbury to the west and to the west of Route 126 to Barnaby River, then across the southwest and northwest Miramichi Rivers west of Newcastle and connect with the Newcastle Terminal on the Chaplin Island Road. It then proceeds north from Newcastle to the Bathurst Terminal along the CNR rail line. From Bathurst the corridor proceeds southwest, skirting the city then north and to the west of Route 11 into Belledune.

From the above your business does/does not currently use this area. Should the proposed route be approved by the New Brunswick Department of the Environment, do you feel that your business would benefit from the existence of a new transmission line right-of-way? ___

Do you feel this route would be used by your club as much as or less than current use of existing transmission line right-of-ways?
________Why?________________________________
____

Would your club have any concerns about the location of this transmission line right-of-way which you would like included in the report submitted to the New Brunswick Department of the Environment. If yes, details:
____
____

7. That concludes my questions about your outfitting use of the area. However, would you know of any other recreational activities which are conducted in this area and are any of these activities generally popular?

Canoeing ___Popular___; Area____________________________

Cross-Country skiing___ Popular__; Area ________________________

Fishing____Popular ___; Area:__________________________

Hunting___ Popular ___; Area: __________________________

Camping __ Popular ____; Area:__________________________

Wild Food harvesting: fiddleheads____; strawberries _____; blueberries _____;

trapping small game _____; Popular ones: _________; Areas:

____

____

Others (specify)________________________.

Would you have just a general idea on the number or percentage of people in your village/parish who use the area? An estimate or approximate is fine - we are just trying to get a "general feel" for the relative popularity of one activity in comparison to other outdoor activities (i.e. hunting and fishing less popular than cross-country skiing or camping or snowmobiling)

____

____

____

That is the last of our/my questions. I would like to thank you for your time in answering these questions. You have been most helpful - the information you have provided will be included in the report we submit to the client and to the Department of the Environment. Just to check, you are the Owner/Operator/General Manager of the business? __________________. Once again, thank you very much. Conclude the interview.

APPENDIX F
AVIATION, RESIDENTIAL AND MUNICIPAL CONSTRAINTS

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This appendix describes the rationale for the avoidance of airports and their restriction zones; for residential areas; and for specific municipalities and LSDs.

F.1 Airports

The Air Navigation Group of Transport Canada (L. Cormier, M. Reid, pers. comm.) has detailed the constraints and restrictions regarding two major and four minor airports within and near the transmission line corridor. These constraints and restrictions fall into two classes: physical and electronic. The physical constraints are:

- Minimum Enroute Altitude (MEA); and
- Minimum Obstruction Clearance Altitude (MOCA).

The electronic constraints pertain to the Instrument Landing Systems (ILS), if any, in place at airstrips.

The constraints should allow the proposed transmission line to be located within the corridor in an area that will conform with the physical and electronic zoning protection applicable to airports and with the standards established by Transport Canada Publication TP 312: Aerodrome Standards and Recommended Practices.

Airports within and near the study corridor, and their restrictions, are detailed below:

F.1.1 Rogersville

Rogersville is a Code 1 airport operated by Maritime Air Services Ltd., has instrument landing approach systems requiring a 3,962 m space. There should be no power line within 1,219 m (L. Cormier, pers. comm.). However, there is a 5 percent approach slope protection with a divergence of 15° from the end of the runway and with a probable width of 23 m at the base. There are to be no structures or towers within 30.5 m along the sides of the airport; there is also a 20 percent transitional slope restriction.

F.1.2 Canadian Forces Base Chatham

Canadian Forces Base Chatham has restrictions for transmission line placement which are as follows (S. McFadden, pers. comm.):

- airport zoning height restrictions will not permit any construction within a distance of 3.7 km from the west end of the active runway;
- the area from 3.7 to 12.95 km from the west end of the active runway is subject to restrictions based upon minimum descent criteria associated with the active runway; and
- construction is limited in this area to not exceed 76.2 m above sea level.

This maximum restriction zone extends as far west as Lower Derby on the Southwest Miramichi and the west side of the Eel Ground Indian Reserve. Chatham is presently a Department of National Defense (DND) airport; however, Transport Canada may be taking over the administration of the airport within 2 or 3 years (M. Reid, pers. comm.). If this occurs, new guidelines will be developed, resulting in possible further restrictions. Transport Canada would establish an Approach Surfaces protection limit within a 2 percent slope for 5,486 m; there would be a divergence of 15° on either side of the runway;

F.1.3 Bathurst

Bathurst airport is operated by the Bathurst Regional Airport Commission Inc. Increased air traffic is expected in the summer of 1989 due to commercial airline landings (M. Freimanis, pers. comm.). Bathurst airport restrictions for powerline placement are as follows (M. Reid, L. Cormier, pers. comm.):

- no power line within 3,962 m of the centre of the airport if the towers are higher than 100 m above mean sea level;
- no power line within 3,353 m of the end of the extended runway centerline under any circumstances;
- and there is a 14 percent transitional slope restriction to the sides of the runways, but this should fall within the 3,962 m circle (for Code 3 and 4 airports).

F.1.4 Tabu

Tabu, situated on the Route 8 corridor, is a Code 1 (non-instrument) airstrip used by the Forest Protection Service for spruce budworm spray operations and by DNRE for forest fire surveillance. There is a small powerline beside one of the two runways, which are 732 m long, and have a 2,530 m restriction from the ends of the runways, within a 5 percent slope (M. Reid, pers. comm.).

F.1.5 Rosehill

Rosehill, west of South Tetagouche, is inactive at present; if active, it would have the same restrictions as Tabu (M. Reid, pers. comm.).

F.1.6 Belledune

Belledune is a non-certified, privately-owned airstrip with a runway 1,006 m long and 23 m wide (R. Ritchie, pers. comm.). The airstrip is owned and operated by Brunswick Mining and Smelting Ltd. and is located southeast of their facilities in Belledune. Although the airstrip is registered with Transport Canada, i.e. it is published in the Canada Flight Supplement, its non-certified status means that there are no Ministry of Transport restrictions on construction within its airspace.

F.2 Communities

F.2.1 Residential Areas

Residential areas have been divided into four constraint classes, as follows:

- Class 1 - high density subdivisions, cities, towns, commercial areas; there are few, if any, windows, i.e., gaps which would provide space for a 50 m right-of-way;

- Class 2 - high and moderate density ribbon development; residential areas on roads running parallel to the proposed right-of-way, even if the residential development is sparse; farms with a cluster of buildings; windows are moderately spaced very close, but are present with more frequency than those in Class 1 areas;

- Class 3 - low density ribbon development; isolated buildings; numerous wide windows; and

- Class 4 - no residential development; a stretch of road with no residences; can exist between discontinuous areas of the higher classes.

F.2.2 Municipalities

Cities, Towns and Villages within the study corridor were contacted for restrictions, zoning by-laws, concerns, etc.; these are detailed below.

F.2.2.1 City of Bathurst

City of Bathurst officials stated that any development in the Middle River Watershed, which is the source of their municipal drinking water, would be of major concern (M. Freimanis, pers. comm.). The corridor impinges upon the industrial park located at the southern end of the City. As well, the Bathurst By-pass and associated interchange ramps are located near the area. Officials noted that there would be increased air traffic at the Bathurst airport because of commercial airline landings (See Section D.1.3). The recent Watershed Designation Study (Fiander-Good Associates Ltd. 1989) stated that the transmission line crossing through Carter's Brook watershed is of concern to the City with respect to the method of maintaining the easement: hand-cutting versus herbicides and hydroaxes.

F.2.2.2 Town of Chatham

Town of Chatham officials did not respond to requests for information and concerns. The Town is situated east of any alternative routes; furthermore, the eastern edge of the study corridor includes only a very small portion of the western portion of the Town.

F.2.2.3 Town of Newcastle

Town of Newcastle officials stated that there would be great difficulty crossing east of the Repap mill. There are commercial and residential zones which would have to re-zoned to accommodate a transmission line. This would be expensive and problematic. The New Brunswick Department of Transportation is planning a bypass to the west. If the line were to be constructed within municipal limits, the only location would be at the westerly boundary (P. Hayes, pers. comm.).

F.2.2.4 Village of Belledune

The Village of Belledune would prefer not to have the line within the community (J. Hodgins, pers. comm.).

F.2.2.5 Village of Douglastown

That portion of the Village of Douglastown within the corridor is 75 percent residential and is zoned R1 (R. Kierstead, pers. comm.). It could be possible to place the line through the middle portion of the village, then north; the southern portion is a probable growth area, as is the Williston Road area north of MacKinnon Road. The new line could go north of the existing line, or at least within 0.5 km south. A right-of-way could be placed within City limits only west of Route 8, at the westerly boundary.

F.2.2.6 Village of Nelson-Miramichi

The Village of Nelson-Miramichi has a restricted development area due to the mills at its eastern and western ends. There are 2 high voltage lines at present within the incorporated area. The Council stated a preference for the lines to be located on the west end of the CNR mainline, and not through the village core (V. McCarthy, pers. comm.).

F.2.2.7 Village of Point Verte

The Village of Pointe Verte is concerned about the corridor passing through municipality boundaries, which are being expanded west to Route 11 (D. Hammond, pers. comm.).

F.2.2.8 Village of Rogersville

The Village of Rogersville is concerned about the corridor passing through municipality boundaries and expanding growth areas (G. Fournier, pers. comm.).

F.2.2.9 Village of Salisbury

Village of Salisbury officials stated that the line should avoid the village limits so as to not affect property values, health of residents, and radio reception (R. Tait, pers. comm.).

F.2.3 Local Service Districts

Local Service Districts with the study corridor and which had official committees, were contacted for their concerns, restrictions, etc.

- Acadieville had no concerns (J.-P. Goguen, pers. comm.);
- Allardville officials stated that one alternative would be to follow the existing corridor, i.e. along the railway; the residential area must be avoided (J. Ward, pers. comm.);
- An Allardville Centre official stated that there were no objections, except that the route should not be located along Route 8 (J.-G. Robichaud, pers. comm.). A new Route 8 by-pass between Tabusintac and Bathurst was opened in spring, 1989; this crosses through the northern portion of the corridor;
- Armstrong Brook queried the exact location of the route, but had no concerns (J. Noel, pers. comm.);
- Chatham Head had no concerns except private property; the end of the runway at Chatham Air Force Base; and the assumption that no one would want the line to go through their property (T. King, pers. comm.);
- Collette had no concerns (P. Poirier, pers. comm.);
- Douglasfield officials stated that the community is a growing residential area; there was some concern about environmental hazards (R. Walsh, pers. comm.);
- Harcourt officials would prefer the line to go through the west side of the LSD; there were no other concerns (H. Wry, pers. comm.);

- Nordin is investigating concerns, and requested clarification of the issues (T. Whalen, pers. comm.);
- St. Paul focused on the use of herbicides on the right-of-way which may have adverse effects on fish habitats within streams, and on wildlife (M. Henri, pers. comm.); and
- Weldford had no concerns (J. Morton, pers. comm.);

The following two Local Service Districts are presently undergoing confirmation of legal status, and were contacted at a later date:

- Nicholas-Denys; and
- Alcida/Dauversière.

No replies were received.

F.2.4. Planning Commissions

Several planning and industrial commissions were contacted; their concerns and comments are detailed below:

- The Town Planning Commission for the Greater Moncton Planning District had no obvious problems during a preliminary review of the project (K. Stevens, pers. comm.). The Commission administers the area outside of the Salisbury Village and Parish line under contract to the province;
- The Kent District Planning Commission stated that the proposed project is acceptable unless new land is purchased by NB Power, at which time the Planning Commission should be contacted (G. Léger, pers. comm.). None of the five municipalities under the commissions jurisdiction which have zoning by-laws are within the study corridor (M. Dumesnil, pers. comm.); and
- The Miramichi Planning District advised us to contact individual municipalities which were within the corridor and which had zoning by-laws: Newcastle, Chatham, Douglastown and Nelson-Miramichi (F. Loggie, pers. comm.).

APPENDIX G
PUBLIC CONSULTATION (OPEN HOUSES)

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G.1 Open House Sessions

G.1.1 Methodology

During the latter stages of the Environmental Impact Assessment, the final Guidelines for the EIA required that NB Power consult with local residents within the study corridor who could potentially be affected by the project. NB Power held open house sessions to obtain the input of the public regarding their concerns for the proposed route and project.

A series of seven Open House sessions were held at strategic locations along the route:

- Salisbury;
- Harcourt;
- Rogersville;
- Newcastle;
- Allardville;
- Bathurst; and
- Belledune.

These sessions were held in February 1990 following route verification.

The Open House sessions were set up with a display:

- taking the public through the EIA Guideline requirements;
- discussing the 15 km study corridor;
- explaining how the proposed route was selected through constraint mapping;
- displaying the constraints for the entire route; and

- displaying all property maps relevant to the area where the Open House was held.

Questions were answered at all stages of the display by NB Power's consultant, with any specific property or other concerns directed to the NB Power personnel present.

G.1.1.1 Salisbury

The Salisbury Open House, February 19, 1990, was attended by 30 to 32 people, including the Mayor of Salisbury and two Councillors. Several were interested in the EIA process and others in attendance came to the session in order to "...find out if the line was going to be through or near their properties." Several individuals indicated that the route was satisfactory because the proposed route is not "coming near them".

One gentleman questioned NB Power's practice of spraying the line and a NB Power spokesman explained their practice of how and where the herbicides are used, and how buffer zones are applied along sensitive areas.

Potential problems regarding alignment of the proposed route were discussed with two local residents. Problems concerning increased access by snowmobilers to land containing Christmas tree farms were brought up, as were concerns regarding EMF and increased access to hunters. Both the consultants and NB Power personnel addressed these concerns.

G.1.1.2 Harcourt

The Harcourt Open House, February 20, 1990, was attended by 22 people, most of whom were from Harcourt. The prime objective of attendees was to determine the location of the proposed and alternative routes with respect to their own properties. A majority of the attendees were interested in employment and starting time of construction and were directed to NB Power personnel. Several people pointed out that the area west of Harcourt is prime for hunting and that the proposed route apparently avoids most of the important deer areas.

G.1.1.3 Rogersville

The Rogersville Open House, February 21, 1990, was attended by 14 people, including the Town Administrator for Rogersville. The prime objective of the majority of attendees was to determine the location of the proposed alternative routes with respect to their own properties.

Questions were raised as to NB Power's tower construction practices and how NB Power compensates owners for wood which must be cleared. An improperly labelled property on LRIS maps was brought to NB Power's attention, as was the extensive use of existing transmission line right-of-ways by snowmobiling clubs and others. A couple of people who were interested in employment left their names with NB Power personnel.

G.1.1.4 Newcastle

The Newcastle Open House, February 22, 1990, was attended by 12 people, including the local MLA. The majority of attendees were from the Newcastle-Chatham area. Two local land owners were interested in determining the location of the proposed route in relation to their own properties, the majority of attendees were simply interested in the EIA process and how the proposed and alternative routes were selected. Concern was expressed by one attendee regarding the location of an alternative route, and this same attendee was unhappy with the idea of opening up the area to snowmobile travel, as the machines kill crops and cut oxygen to plant roots. A few of the attendees were remarked on the need for another transmission line, and the consultants and NB Power personnel agreed with and supported the concept of conservation.

G.1.1.5 Allardville

The Allardville Open House, February 27, 1990, was attended by 20 people, including the Allardville Local Service District representative. Most people came to enquire about the location of the transmission line. Almost everyone expressed satisfaction with the route selection process and the proposed route location. Questions regarding employment opportunities were directed to NB Power personnel, as was an outfitter's concerns regarding the transmission line crossing his salmon pools and outfitter's lodge located on the Nepisiguit River.

G.1.1.6 Bathurst

The Bathurst Open House, February 26, 1990, was attended by 17 people. Several people were concerned about the location of the line in relation to their own property. Some asked questions about construction and were referred to NB Power personnel. Concerns were expressed about the effects of EMF, past experiences with transmission lines on peoples properties, and stream crossing requirements. It was mentioned that as the New Brunswick Department of the Environment does not have enough officers, local groups will have to be the watchdogs during construction , as it is perceived that contractors and their crews might take short-cuts.

G.1.1.7 Belledune

The Belledune Open House, February 28, 1990, was attended by 23 people, including the Local Service District representatives from Nicholas-Denys and Alcida/Dauversière. Most attendees were concerned with the location of the proposed route in relation to their own properties. Concerns were raised regarding EMF, aesthetics, and the effects of the transmission lines on radio and TV reception. A few attendees were interested in the route selection process, and one made a suggestion as to avoiding the built up areas of Sormany and Nicholas-Denys. One forester was interested in the location of the proposed route and NB Power's cutting schedule.

APPENDIX H
DEER WINTERING AREAS

TABLE H-1: DEER WINTERING AREAS (DWAs) BISECTED BY THE PROPOSED ROUTE, INCLUDING THE AREA (IN HA) TO BE REMOVED BY THE PROPOSED RIGHT-OF-WAY (ROW)

Monteagle Wintering Area (Freehold Land)

Stand No.	Forest Unit	Maturity/ Crown Closure	Distance Crossed (m)	Area (ha)
8337	SP10	R4	110	0.55
8007	BS8	M3	370	1.85
8869	SP6 SW3	I3	130	0.65
8441	SP7 SW3	R62	120	0.60
8439	SP7 SW2	Y3	100	0.50
8035	SP6 BF3	I3	160	0.80
7722	SP6 EC3	I3	70	0.35
8958	EC6 SP3	M5	350	1.75
7827	EC6 SP3	M4	300	1.50
7818	EC6 SP3	M3	330	1.65
8764	SP5 IH2	M3	200	1.00
8654	SP5 IH2 SW2	I62	230	1.15
8232	SP5 IH2 SW2	M3	40	0.20
7426	SP5 SW2 HW2	I2	80	0.40
8020	SP4 HW3 SW2	M3	30	0.15
8213	TH4 IH3 DF2	M3	70	0.35
----	Right-of-way	--	55	0.28
6333	Clearcut	Y	220	1.10
8648	Agriculture	--	620	3.10
TOTAL ROW			**3585**	**17.93**
TOTAL CONTIGUOUS DWA				**1141**
% CROSSED BY ROW				**1.57%**

Deer Wintering Area #5837-1

Stand No.	Forest Unit	Maturity/ Crown Closure	Distance Crossed (m)	Area (ha)
2798	BS8	M63	120	0.60
1883	BS6 PI3	M63	150	0.75
2284	BS6 SW2	M63	130	0.65
2494	SP6 JP2 IH2	I63	100	0.50
2598	BS6 IH3	I61	100	0.50
2589	IH4 BF3 SP2	M63	640	3.20
2662	wetland	---	50	0.25
TOTAL ROW			**1290**	**6.45**
TOTAL CONTIGUOUS DWA				**451**
% CROSSED BY ROW				**1.43%**

(Continued)

TABLE H-1: DEER WINTERING AREAS (DWAs) BISECTED BY THE PROPOSED ROUTE, INCLUDING THE AREA (IN HA) TO BE REMOVED BY THE PROPOSED RIGHT-OF-WAY (ROW) (CONTINUED)

Deer Wintering Area #5213-3

Stand No.	Forest Unit	Maturity/ Crown Closure	Distance Crossed (m)	Area (ha)
7077	BF6 SP3	M62	30	0.15
7479	BF4 SP3 TH2	I62	20	0.10
6470	BF4 HW3 SW2	M62	340	1.70
7083	TH6 FS3	M2	210	1.05
7079	wetland	---	70	0.35
6880	wetland	---	100	0.50
TOTAL ROW			770	3.85
TOTAL CONTIGUOUS DWA				150
% CROSSED BY ROW				2.56%

NOTE: Forest Unit

BF	Balsam Fir
BS	Black Spruce
SP	Spruce (not identified to species)
SW	Softwood
HW	Hardwood
EC	Eastern White Cedar
IH	Intolerant Hardwood
TH	Tolerant Hardwood
DF	Dead Fir
FS	Fir/Spruce

Numbers refer to percent dominance, i.e., 6 = 60%

Maturity

R	Regenerating
Y	Young
I	Immature
M	Mature
O	Overmature

Crown Closure

61	10-30% Patchy, Variable
1	10-30%
62	30-50% Patchy, Variable
2	30-50%
63	50-70% Patchy, Variable
3	50-70%
64	70-90% Patchy, Variable
4	70-90%
5	90% +

SOURCE: G. Redmond (pers. comm.)

APPENDIX I
VEGETATION SURVEY

BOTANICAL ANALYSIS
HAROLD R. HINDS
BIOLOGIST

RARE OR ENDANGERED FLORA AND SENSITIVE HABITAT INVENTORY REPORT FOR SALISBURY TO BATHURST PROPOSED HYDRO ALIGNMENT

METHODS: Aerial photographs of the area under consideration were examined for possible areas of old growth, escarpments, bogs or other features that might indicate the presence of rare or endangered flora or sensitive habitat. Extensive notes were made of possible areas. Field work was carried out on September 9-12, 1990 following the alignment wherever possible from south to north. Areas of possible interest from the aerial photographs were surveyed where accessible as well as all points that were accessible from intersecting or close approaching roads. In total approximately 20 kilometers were surveyed on foot.

All relevent literature and contact persons were consulted for information concerning this investigation. Also information concerning the distribution of rare and endangered flora and critical natural areas was consulted.

RESULTS: The vegetational cover of the area under consideration is greatly varied but the alignment consists mainly of old and some cultivated fields, second and third growth mixed woods, black spruce and jack pine barrens, acid bogs and alder thickets. No old growth forest appears to occur along the chosen route.

CONCLUSIONS: No rare or endangered flora or critical natural areas were found during this survey. The alignment was wisely chosen to avoid areas that might be of ecological importance. Some uncommon species of vascular plants were collected during the field investigations but these are widely distributed and not threatened.

RECOMMENDATIONS: Although no rare or andangered flora or critical natural areas were found to occur along the proposed alignment there was a rare plant found under a hydro line not far from the alignment. Also in various parts of the Province there are instances were rare plants occur in the openings created by transmission rights-of-way. It would indicate therefore that the possibility exists to increase rare plant habitat by the creation of these openings in the otherwise homogeneous Acadian forest. The problem, however, is the method of maintaining these openings. It is probable that most of our rare or endangered flora would be distroyed if sprayed by the herbicides currantly used to control the vegetation along these transmission lines. If a more benign method of vegetation control could be employed along these openings there would be a great possibility of increasing rare plant habitat in the Province.

Therefore I am recommending that wherever possible manual or other methods be used to control vegetation under transmission lines.

HAROLD R. HINDS

SEPTEMBER 18, 1990